EFFECTS OF SELECTED POLICIES AND PROGRAMS ON WOMEN'S HEALTH AND NUTRITIONAL STATUS

VOLUME I
Synthesis of Case Studies

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I. INTRODUCTION AND OVERVIEW

This report is presented in two volumes. Volume I provides a synthesis of case study data on five topic areas: global trends in women's nutritional status, effects of household income on women's health and nutritional status, women's nutritional status and productivity, women's nutritional status and morbidity and household structure and women and children's nutritional status. The synthesis in these five selected areas draws on data from the 12 individual case studies presented in Volume II as well as more macro level data. The information in the section on global trends in women's nutritional status come from analyses conducted on a data base of 339 studies complied by the Sub Committee on Nutrition of the United Nations. This helps provide a global context for the country and subnational level perspective provided in the series of case studies presented in Volume II.

A recent symposium held in Harare on food security for high level policy makers in Africa concluded that agricultural policies and programs as they have been implemented, are rarely gender neutral (World Bank 1990). Yet a major conclusion from this same workshop was that we know relatively little about the gender specific effects of a range of agricultural policies and programs. This is particularly true for the impact of public policies on women's nutritional status.

This void in our knowledge about effects of policies, programs and projects on women's health and nutritional status was the key reason for undertaking the present activity. Using extant data available at

IFPRI and elsewhere, the research team[1] analyzed the effects of a wide variety of policies including commercial agriculture, agricultural price policy, and macro economic adjustment policies--on women's health and nutritional status. The purpose of this exercise was twofold. First, there was an interest in identifying the impact of selected policies and programs on women's nutritional status and some indication of the process leading to these outcomes. Secondly, the project was also interested in identifying types of indicators that might be used to monitor the impact of development policies on women.

Preliminary to final selection of data sets and development of the analysis plan, a one-day workshop was held at IFPRI to discuss the overall approach. A summary of this workshop is included in Appendix I. In addition, three background papers[2] were used to summarize information currently available. Issues laid out in these three papers also helped focus the analytical work in this project.

Twelve data sets were ultimately selected for further analysis. The selection process for the final data sets was guided by the type of variables that were needed and final selection was based on

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[1]Research Team included: Lawrence Haddad, Pauline E. Peters, Maarten D.C. Immink, Ellen Payongayong, Marito Garcia, Emmanuel Canteras, Stephen A. Vosti, Julie Witcover, Patrice L. Engle, Beatrice L. Rogers, Zohra Lukmanj, L. Magambo, J. Lindstorm, M. Ngonyani, and C. Mayombana.

[2]Background papers included "Effects of Gender of Head of Household on Women's and Children's Nutritional Status", Trends in Women's Nutrtional Status: Some Implications for Public Policy", and "Gender and Adjustment: Theory and Evidence to Date".

discussion with Office of Nutrition, and Office of Women in Development.

The twelve data sets include: four on the commercialization of agriculture (Kenya, Philippines, Malawi and Guatemala); five on price policy (Kintampo - Ghana, Philippines Pilot Food Subsidy Project, Ethiopia, Dominican Republic, and Tanzania) two on macroeconomic adjustment policies (Pakistan, Ghana); and one examining effects of gender differential expenditure patterns on nutrition (Engle-Guatemala).

The remainder of this report is organized into two volumes. The first volume provides a synthesis of the case study findings organized around five broad issues. This is followed by Volume II, which presents the findings from the twelve individual case studies. The data presented in the specific case studies is not repeated in the synthesis but rather additional information not contained in the country studies is used to summarize cross-cutting themes.

II. CASE STUDY SYNTHESIS

A. GLOBAL TRENDS IN WOMEN'S NUTRITIONAL STATUS

Throughout their life cycle, women are vulnerable to malnutrition for both social and biological reasons. In many parts of the world, girls are discriminated against, in access to food, health care, and education. In early adulthood, women risk early pregnancy and are therefore more predisposed to risk than boys. During their reproductive age, women are subject to many kinds of stress while

assuming a major part of domestic work and for many in work outside the home. The long hours of work and multiple roles of women particularly in settings of poverty generally result in general undernutrition.

As background to the present report, an assessment of the level and trends of women's nutritional status was done using anthropometric indices, and anaemia. The assessment used a database assembled by ACC-SCN (Geneva), comprising of 339 studies reported in the literature for the period 1970-1990. Major conclusions are summarized in ACC-SCN's Second Report on the World Nutrition Situation (1992).

There are five indicators chosen to estimate the magnitude of the nutrition problems in women. Due to the stress and the problems and vulnerability during the reproductive age, the age groups commonly reported are those for the 15-49 year old women. The first four indicators concern anthropometry--(1) stature measured by stunting (cut-off below 145 cm), (2) weight (cut-off below 45 kg.) (3) thinness measured by body mass index (BMI cut-off of 18.5) and (4) mid-upper arm circumference (cut-off of 22.5 cm). The cut-off points are determined by criteria related to pregnancy outcome (obstetric risk), and were chosen partly as they are most widely reported in the literature. The second set of indicators include anaemia using WHO recommended cut-off haemoglobin concentration of 11 g/dl for pregnant and 12 g/dl for non-pregnant women. The results are summarized in Table 1.

The prevalence of short stature in the developing regions of the world, indicates that the problem is particularly extensive in Asia,

and in Latin America. In contrast, women in Sub-Saharan Africa are generally taller. These regional comparisons emphasize that women are particularly stunted in Asia, but in contrast show relatively little deficit in Africa. The prevalence of underweight (below 45 kg) generally follow the regional patterns, except that the proportions are considerably higher. For example, in South Asia the proportion of underweight women is on average about 60%, and 45% in Southeast Asia, and around 20% in Sub-Saharan Africa.

The results for prevalence of low BMI (which is weight divided height squared--a measure of thinness) indicates substantial problems in South and Southeast Asia (about 40%) and a significant prevalence in Sub-Saharan Africa (around 20%). Thus, the underweight among women in Africa are mostly thinness--which is in line with the low prevalence of stunting. In contrast, the problem estimated for Middle America is related more to stunting than thinness. Estimates of low arm circumference--also an indicator of thinness--generally support the conclusion drawn from the BMI data.

Global estimates (developing countries) for adult women by physiological grouping for the 1970s and 1980s indicate that overall, the very high prevalence of anaemic women has not significantly

Table 1 —Women's Nutritional Status by Regional Groupings (1980s)

	Percent Below 45 Kilograms*	Percent Below 145 Centimeters*	Percent Below 18.5 BMI*	Percent Below 22.5* Centimeters Arm Circumference*	Percent Married Women 15-19 Years Old	Female Life Expectancy at Birth	Maternal Mortality Rate	Percent Mothers with Low Birth Weight Babies	Percent Anemic Pregnant Women*	Percent Anemic Non-pregnant Women*
Sub-Saharan Africa	21	2	22	13	32	53	655	13	56	42
Near East and North Africa	6	5	4	39	23	60	500	10	45	28
South Asia	62	16	41	54	41	53	650	28	58	69
Southeast Asia	44	17	40	36	12	63	420	13	49	57
China	19	2	14	16	12	72	55	9	36	33
Middle America and the Caribbean	20	15	15	12	26	70	230	12	34	26
South America	10	11	7	10	17	70	210	9	26	20

Sources: WHO (1990, 1986, 1984); UN (1990); UNESCO (1990); ACC-SCN Database on Women's Nutrition (1991)

* Women at 15-49 year age group

changed over the last two decades. There is however, some evidence that anaemia is rising among non-pregnant women in South Asia and Sub-Saharan Africa. However, there was a small but statistically significant improvement in the pregnant women group. The decline in prevalence among pregnant women were stronger in Southeast Asia, South America and Sub-Saharan Africa, and much less in South Asia.

The reasons for the improvement in the pregnant groups remains unclear. One hypothesis is that of the nearly exclusive emphasis on the pregnant women group in most of the intervention programs. For instance, primary health care programs focused on maternal care in most regions of the world. Safe motherhood initiatives were already in place in some countries even before the 1987 Nairobi conference that launched the Global Safe Motherhood Program.

There are clear significant differences in the prevalence of anemia across regions. The regions with the highest overall prevalence are South Asia, Sub-Saharan Africa and Southeast Asia. The magnitude of the problem in South Asia is an important policy concern because the absolute numbers are also the highest in the world. China's overall prevalence also ranks high in problem areas largely because of the absolute numbers. The least affected regions are the women in South America who have consistently improved in the last two decades.

Poverty alleviation programs implemented over the past 20 years have multiple goals one of which is the improvement of health and nutritional status. The next section examines the effect of selected income generating programs on women's nutritional status.

B. EFFECTS OF HOUSEHOLD INCOME ON WOMEN'S HEALTH AND NUTRITIONAL STATUS

A basic assumption in many of the economic development policies that have been pursued by developing country governments is that the particular policy will increase household welfare. This usually translates into the expectation that household income will increase. A corollary to this is that the increase in household income will improve food security and nutritional status.

Until recently little attention was focused on women's nutritional status. As shown from the prior section, few national level studies on women's nutritional status have been conducted and thus much of our information on women's nutrition is gleaned from very narrowly focused research studies. Not surprising even less is known about the effects of a range of income generating policies in women's nutritional status.

Table 2 summarizes information for some of the case studies looking at links between women's nutritional status (using a series of measures) and household income. The household income/nutritional status links are inconsistent across the studies presented. For example, the studies on the commercialization of agriculture provide mixed evidence on the income/BMI link. In Kenya, there is no significant association between increasing household income and women's significant effect on women's BMI. In Kintampo, Ghana, income is marginally associated ($p. < 0.08$) with women's BMI.

The two Ghana case studies provide an interesting contrast. The World Bank Living Standards Measurement Study data from Ghana suggest a positive effect of household income per capita on women's BMI.

Table 2—Impact of policy/program on women's health/nutrition by country

Policy/Program Area	Impact on Women's Health and Nutrition						
	Moribidty	Anthropometry			Protein		
	Daysick	Bmi	Weight	Height	Calorie	Protein	Iron
A. Commercialization of agriculture							
1. Kenya	.0157	.0092	.0402	.0764**			
Income per capita							
Time allocation							
Home production	.0104	-.0055	.0049	-.0132			
Agriculture	.0045	-.0356***	-.0249	-.0075			
Total	.0563	.0145	.0446*	.0158			
2. Philippines							
Income per capita	-.0170	.1068**	.1279**	.1137**	.0872**	.1004**	
Time allocation							
Agriculture	.0389	-.0511	-.0464	-.00053	.0382	.0037	
Non-agriculture	.0128	.0861*	.0923**	.0430	-.0255	.0239	
Off-farm	-.0088	-.0798*	-.0583***	.0392	-.0514***	-.0818**	
Total	-.0458***	-.0362	-.0355	-.0012	.0155	.0100	
B. Price policies on food crop							
1. Philippine pilot							
Total income							
Income per capita					-0.08670***	-.00413	
total time allocation					.02174	.11265*	
					.02701	.01057	
2. Ghana (LS)							
Income per capita	.0343	.0492**	.0554**	.0463			
Time allocation							
Work done at home	.0213	.1558**	.1632**	.1571**			
Total	-.0392*	.2049**	.2359**	.2500**			
C. Macroeconomic adjustment							
1. Pakistan							
Income per capita	-.0909*	.1630**	.1505**	.0392*			
Time allocation							
Home produciton	-.0947*	-.0780**	-.0514*	.3053			
Agriculture	-.0466	-.1510**	-.1929**	-.1159**			
Non-farm	-.0270	-.0923*	-.0854*	-.0230			
Total	-.1032*	-.0208	-.0363*	-.0239			

Note: 1-tailed Signif: * -.01 ** = -.001 *** -.05

However, the Kintampo case study on women's credit in Ghana, does not show this significant effect of income on women's BMI.

The net effect of increased household income on women's nutrition is modified by the indirect effect of policies on the energy intensity of women's time allocation patterns. In the Kenya case study, data suggest that since the amount of time women allocate to home production and agricultural activities did not decrease with cash crop production, the increased household income accruing as a result of sugarcane production had minimal effect on women's BMI.

This same finding is found in a very different setting--Guatemala. The positive effect of increased household income on women's BMI is offset by the negative effect of participation in the cash cropping scheme on women's BMI; women from the export crop producing households have indicated that time into agriculture has increased presumably with a negative effect on women's nutritional status (Immink et al. 1992).

The apparent lack of response of women's BMI to increasing household income in Kintampo, Ghana is due in large part to the time burden of women. At all levels of income, women continue to be physically active. Even in Pakistan where women are less integrated into the market economy, results in Table 2 suggest that the beneficial effects on women's BMI of increases in household income are counterbalanced by negative impacts of time into home production activities and time into agriculture.

The findings on the income/nutrition and nutrition/time links shown for the various studies in Table 2 seem to vary little with the

particular indicator of nutritional status. Therefore, BMI, weight and height indicators appear to exhibit the same relationship with explanatory variables.

The Ethiopia case study findings also suggest that it is not simply income but the form and timing of the income that may be equally important for improving women's nutritional status.

Often evaluations look simply at the direct links between a policy and its anticipated effect; in this case, the impact of income on women's nutritional status. However, the results from these case studies suggest that the indirect effects may be important to assess in order to ascertain the net effect of a particular policy. For the rural African case studies the results suggest that income generating policies which do not simultaneously decrease time devoted to work and/or the energy intensity of work activities will have a limited impact on improving women's nutritional status. Surprisingly, even in land scarce environments such as Pakistan, there appear to be negative effects of time patterns on women's nutritional status. This issue of income/time/nutrition tradeoffs is taken up in another way in the next section as we look at the issue of nutrition/productivity links.

C. WOMEN'S NUTRITIONAL STATUS AND PRODUCTIVITY

Much attention has focused recently on the links between nutrition and productivity. In particular, enhanced human capital is seen as a key component of increasing agricultural productivity in developing countries where labor is still a major input into crop

production. Improved health and nutritional status are two elements contributing to this improved human capital.

It may be intuitively appealing to believe that better nourished individuals are able to be more productive. However, the nutrition/productivity links are difficult to establish; rather than assuming that improved nutritional status leads to increased productivity it is equally plausible that increased productivity leads to increased income which in turn improves nutritional status.

There are inconsistencies in the nutrition/productivity literature that exist. (For a review of this literature see Kennedy and Garcia 1992). First, the research relating nutritional status to work capacity is more consistent than the research linking nutritional status to productivity. None of the studies to date provide evidence that elucidates the pathways through which improved nutrition improves economic productivity. In addition, many of the studies that have been conducted on the nutrition/wage rate links have been based on samples that were disproportionately male subjects. The few studies that disaggregate data by gender--Sahn and Alderman 1988; Thomas and Strauss 1992--report different results for men and women. This further obscures the causal mechanism between nutritional status and economic productivity. It is unclear why improved nutrition in men but not women would improve productivity.

The case studies contained in this report did not address the question of nutrition/productivity links. The synthesis analyses in this section will pull together results from some of the case studies. Table 3 provides data on individuals. The Ghana data are presented

what do the numbers mean? correlation?

Table 3--Relationship between household income and BMI by country

Terciles of household income (1 = lowest)	Country												
	Gambia[1]	All Ghana		Rural Ghana		Urban Ghana		Pakistan[1]		Kenya	Philippines		Guatemala
	Women	Women	Men	Women	Men	Women	Men	Women	Men	Women	Women	Men	Women
1	20.8	19.65	18.80	19.49	18.76	20.19	18.94	19.74	19.19	22.52	18.18	18.55	22.97
2	20.4	20.56	19.38	20.16	19.19	21.08	19.65	19.87	19.41	21.78	19.13	18.66	23.32
3	20.8	21.35	20.22	20.36	19.89	22.03	20.51	21.01	20.26	21.96	19.51	18.98	23.41
Mean	20.6	20.38	19.39	19.85	19.13	21.22	19.84	20.27	19.77	22.08	18.97	18.74	23.21

[1] Non-pregnant and non-lactating only.

for the entire sample as well as disaggregated for the urban and rural samples. For women, only data for non pregnant and non lactating females are included. Some general observations are worth noting. First, there is not a linearly increasing relationship between BMI and household income in all countries. In the Gambia and Kenya, BMIs for women are, on average, lowest for women in the middle tercile of income.

Men's BMI in Ghana, Pakistan and the Philippines, at each tercile of income is lower than those for women. The one exception is in the Philippines where in the lowest income tercile, men's BMI is higher than women in the same category.

The rural sample for Ghana, at each level of income, has lower BMI than the urban sample at similar levels of income. This is true for both men and women. However, the differences between urban and rural Ghana are more dramatic for the women.

Women in Guatemala have a higher BMI at each level of income of the six data sets presented.

The same relationship is shown graphically in Figure 1 and Figure 2 for women and men respectfully. What is clear from Figures 1 and 2 is that the relationship between increasing household income and the BMI of men and women is different. BMIs in men show a more consistent response to increasing household income than do women's BMI. The BMI/household income relationship for women is also more varied. The slope of the BMI line for urban Ghana is what many think of as the traditional response to increasing income; as income increases there is a steady increase in BMI. However, in the two other African case

Figure 1--BMI by income tercile (adult females)

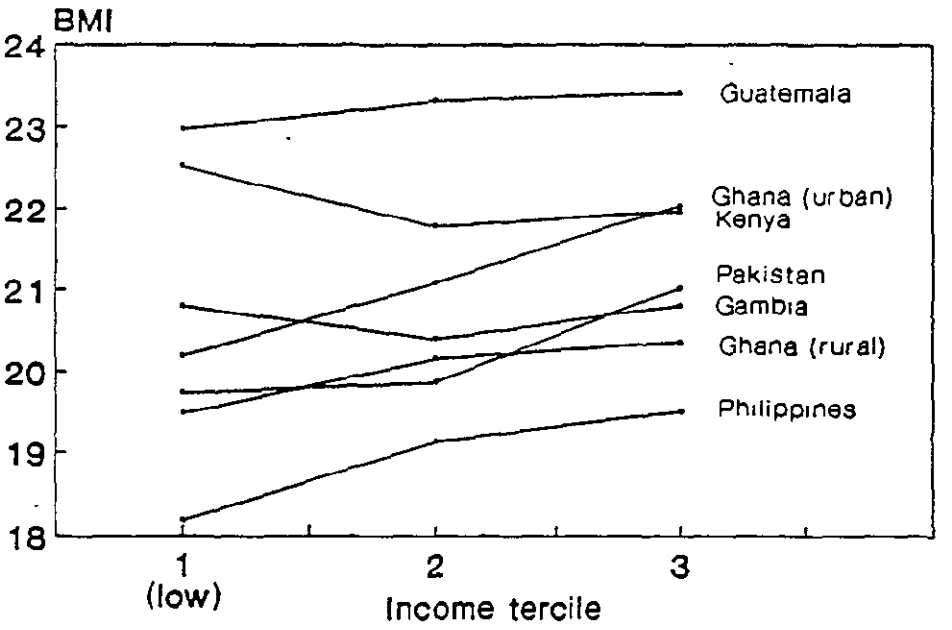
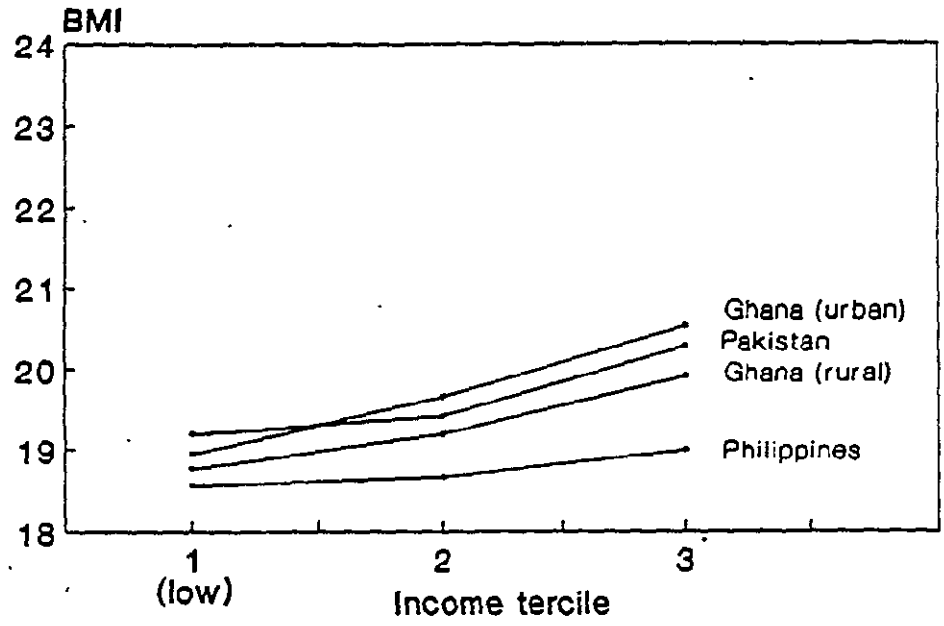


Figure 2--BMI by income tercile (adult males)



studies--the Gambia and Kenya--women's BMI decreases with increasing household income. The factors influencing women's BMI appear to differ across socio-cultural environments.

Table 4 presents data for the percentage of the study samples falling below 18.5 BMI in each tercile of income. The findings follow a pattern similar to what was shown in Table 3 in that the rural Ghana sample for both men and women has a higher percentage of individuals less than 18.5 when compared to their urban counterparts. In general, the percentage of individuals with BMIs less than 18.5 falls with increasing income; the one exception is Kenya where again, the highest proportion of women with BMIs less than 18.5 is in the middle income tercile. Here again it is impossible to assign causality. Higher household income may lead to increases in BMI or alternatively a higher BMI may improve income.

One reason for the apparently low response of BMI to increasing household income in Kenya has already been discussed in the prior section but is taken up again in Table 5. Time allocation data for women from Kenya and the Philippines are stratified by physiological status. The Kenya/Philippines comparison is noteworthy since both of these case studies are looking at the same form of technological change: the shift from maize to sugarcane production. In addition, in both cases, the largest share of the work day for women is accounted for by home production activities--getting water, fuelwood, cleaning, etc. However the women in Kenya are spending approximately twice as much time in these activities as are the women in the Philippines. In addition, women in the Philippines have more leisure time.

Table 4--Percent of sample with BMI less than 18.5 for selected countries by income tercile

Terciles of household income (1 = lowest)	BMI < 18.5 by country												
	Gambia[a]	All Ghana		Rural Ghana		Urban Ghana		Pakistan[b]		Kenya	Philippines		Guatemala
	Women	Women[b]	Men	Women[a]	Men	Women[b]	Men	Women	Men	Women	Women	Men	Women
1	22.5	31.5	47.2	39.2	47.3	36.3	46.8	42.13	41.44	6.68	57.89	43.01	5.9
2	17.4	26.3	37.2	33.4	38.0	27.1	36.2	34.71	38.43	12.11	44.75	44.08	6.9
3	17.7	22.2	25.9	27.3	26.6	22.6	25.2	27.51	24.35	5.50	42.19	40.55	4.3
Mean	19.1	27.6	37.9	35.4	40.1	27.6	34.1	34.09	32.32	8.09	47.91	42.52	5.8

The women in Kenya are using a lot more time for home production than women in the Philippines; this reflects in part the distance to water, fuelwood and also the low level of capitalization of the women. If women could own or hire a cart they wouldn't have to collect water 4 or 5 times a day. Additionally, if household income and/or women's income increased, this could be used to purchase a better source of water - hand pump, rain vat. This capital input could increase the efficiency of home production but this is not the situation for most of the women in rural areas of Kenya. In the Philippines the access to some of these basic services is better. The Kenya time allocation data reflects the poorer overall infrastructure and the implications this has for women's time.

The time allocation patterns for women in Kenya do not differ significantly across pregnant, breastfeeding and non pregnant, non breastfeeding females. Throughout pregnancy women in Kenya maintain the high level of physical activity. In contrast, women in the Philippines have a lower level of strenuous activity when compared to non pregnant, non-breastfeeding women.

The higher household income in Kenya for sugarcane producing households does not result in more leisure time for women; in the Philippines, however, household income in the sugarcane producers, does result in a lower level of energy intensive activity for pregnant women.

The data in Table 5 indicate that most women have no off-farm wage employment. Therefore, establishing the nutrition/productivity links by using wages as the indicator of women's productivity is

inappropriate. Given that the major share of women's time in many rural areas is devoted to home production, a more useful approach to productivity is to explore the links between BMI and time allocation patterns.

Table 6 shows data for women from the Kenya sample who are at or above 18.5 BMI compared to women below 18.5 BMI; the sample is further divided into women from agricultural and non-agricultural households. Patterns of time allocation differ for women in agricultural and non-agricultural households; this is true whether or not women are above or below 18.5 BMI. Women in agricultural households have a larger amount of time devoted to work, higher energy output and a longer portion of the day spent away from home than females in non-agricultural households.

Table 7 presents the results of an OLS regression for Kenya examining the effect of nutrition on total amount of energy expended on work. This variable was computed based on a woman's individual weight, age and proportion of time allocated to specific tasks. The BMI of individual women averaged for the period June, 1984 to March, 1985 was used to explain the energy expended in non-leisure activities (work) for the period 1986 to March 1987.

In the equation, nutrition indicators for both long and shorter term (height) term (BMI) nutritional status are included. Landholdings per capita is used to proxy for different work loads of women in agricultural households. The BMI in the earlier period shows a significant, positive association with time spent in work. Better nourished women (as measured by BMI) are able to spend more time in

Table 5--Time allocation patterns for women from sugarcane and non-sugarcane households, by physiological status, Kenya and the Philippines

Activities	Kenya			Philippines		
	Pregnant	Breast-Feeding	Nonpregnant Nonbreast-feeding	Pregnant	Breast-Feeding	Nonpregnant Nonb east-feeding
Domestic activities						
Sugarcane	8.36	8.40	7.57*	4.03	4.08	3.95
Nonsugarcane	8.72	8.58	7.49*	4.25	4.18	4.33
Own-farm production						
Sugarcane	...	...	...	1.67	1.68	2.43
Nonsugarcane	...	...	...	1.60	2.08	2.62
Child care						
Sugarcane	0.92	1.04	0.60*	0.75	2.67	0.63
Nonsugarcane	0.84	1.05	0.60*	0.90	2.27	0.87
Personal relaxation						
Sugarcane	1.66	1.52	1.77	6.60	5.25	6.38
Nonsugarcane	1.71	1.55	1.81	7.00	5.33	5.97
Nonagricultural employment						
Sugarcane	0.08	0.10	0.09	0.33	0.50	1.03
Nonsugarcane	0.18	0.14	0.19	0.38	0.42	0.90
Strenuous activities						
Sugarcane	3.96	3.78	4.17	2.58	2.50	3.22
Nonsugarcane	4.08	3.99	4.50	2.90	2.90	3.38
Total energy expenditures						
Sugarcane	2,624	2,588	2,536**	...	...	...
Nonsugarcane	2,645	2,550	2,534**	...	...	...
Calories/adult equivalent						
Sugarcane	2,808	2,760	2,635	3,434	2,759	2,945
Nonsugarcane	2,614	2,627	2,649	2,880	2,686	3,072
Energy expenditures/ kilogram body weight						
Sugarcane	44.90	44.90	44.30	47.90	49.70	52.00
Nonsugarcane	44.80	45.50	45.30	50.00	51.20	53.40

Table 6--Time allocation of women 15 to 45 years by BMI status, agricultural and non-agricultural households

	BMI below 18.5		BMI equal/above 18.5	
	Agri HH	Non-agri HH	Agri HH	Non-agri HH
Domestic activities, except child care	7.42	6.79	7.40	6.82
Child care	.92	.36	.89	.92
Animal husbandry	.20	.03	.11	.02
Agriculture, except sugarcane	2.51	1.74	2.53	1.09
Manufacturing	.23	.67	.14	.47
Nonhousehold activities	.49	.00	.69	.40
Agriculture, sugarcane	.18	.03	.06	.05
Employment	.08	1.03	.17	1.80
Relaxing	1.66	1.88	1.58	1.43
Sleep	9.30	9.58	9.40	9.48
Total time, excluding leisure	21.36	20.58	21.36	21.22
Total energy expenditure	2381.98	2147.54	2596.12	2460.19
Time away from home	6.42	3.63	6.50	4.58

Table 7--Determinants of women's energy expenditure in work (home production included)

Variable	B	T-Stat.	Signif. of T
Interaction of BMI and total time ill	-.023	-.808	.4196
Gender of head of household (1=Male)	42.246	1.151	.2504
Total time ill	-.598	-.863	.3884
Land per capita	110.065	3.239	.0013
Age of women squared	-.002	-1.321	.1873
BMI - 1984/1985	20.880	4.349	.0000
Number other women in household	-5.248	-.647	.5182
Percent of preschool-aged children	-.546	-1.305	.1927
Number of live births	1.627	.193	.8474
Age of woman	1.626	1.28	.2014
Height of women	10.64	4.78	.0000
Constant	-657.936	-1.446	.1489
R^2 = .13			
F = 5.73			
Significant F = .0000			

work related activities including home production activities. In addition, at a given level of BMI, taller women have more energy intensive work activities. In this model both BMI and height appear to increase the capacity to carry out work.

The total time sick in period one is not significantly associated with women's work. It appears as though in this setting women must carry out an energy intensive set of activities even when sick. The landholdings per capita variable is significant; women in agricultural households expend more time in labor-intensive activities.

Governments and donors alike realize that one of the critical factors in revitalizing agriculture in developing countries is to raise the productivity of all farmers - women and men. This is essential for sustained food security of nations, communities and households. Within a given agroecological area, agricultural productivity is determined by the amount of land, labor, capital and other inputs that are used, by the quality of these inputs such as the soil fertility and the health and nutritional status of farmers. Part of the renewed interest in links between nutrition and productivity is driven by the interest in enhanced human capital as a key constraint to agricultural production.

Many of the early studies on nutrition/productivity are limited to men. In studies where data are disaggregated by gender, the specific relationships between nutrition and output differ.

The present report utilized data from Kenya to examine the links between female BMI and height on the one hand and time devoted to work activities on the other. Both BMI and height are significant,

positive determinants of time devoted to work. However, it is difficult to value much of this work time since a disproportionate share is devoted to home production activities. Some of the more classic methods of measuring economic productivity such as measuring wage rates are not relevant for women in this setting.

Clearly, there are reasons to justify better nutrition other than simply productivity effects. However, the data from Kenya suggest that more appropriate measures for valuing women's work need to be developed in order to capture some of the nutrition/productivity links which may exist.

D. WOMEN'S NUTRITIONAL STATUS AND MORBIDITY

One of the critical issues related to the nutrition of women is the extent to which poor nutrition predisposes women to illness. In order to examine this issue, data on body mass index--a measure of thinness, defined as weight divided by height squared--in selected countries are used.

For many years body mass index (BMI)--also called the Quetelet's index--has been used in developed countries for assessing obesity and its associated risks of chronic diseases which are common in the affluent societies. In adults, obesity is a risk factor of whole range of conditions including cardiovascular diseases, diabetes mellitus, arthritis, gall-bladder diseases, cancer and respiratory dysfunction (Gurney and Gorstein 1988); and it is no wonder that actuarial estimation factor BMI into the risk calculation of insurance premiums in adults.

Recently, interest has expanded in using BMI for assessing the chronic dietary deficiencies--and on morbidity patterns--in the lower end of the range of the BMI scale. Indeed for policy and diagnosis of problems, it would be important to know the acceptable lower limit at which bodily functions start to fail and subsequently cause illness and dysfunction. The various range of BMI suggested by James, Ferro-Luzzi and Waterlow (1988) for example suggests a cut-off of 18.5 BMI to determine the presence of CED at the population level.

It has been shown that in children that there is a problem of circularity (endogeneity) in causation (Garcia and Alderman 1990,)--that low weights can cause illness, and that illness episodes can cause low weights. In order to understand the functional significance of low BMI on health, it is necessary to carefully control for this two-way interaction. The circularity in the relationships between body weight and morbidity are more difficult to test in adults compared to children because activity (and energy costs) in adults vary enormously. Among adults, information about the relationships between low BMI and risks to health is very limited; no systematic study on the relationship between low BMI and ill health are available.

Four data sets from household surveys carried out by IFPRI and the World Bank between 1983 and 1988 are used to examine the low BMI-morbidity relationships--Philippines, Kenya, Pakistan and Ghana. The first three were collected as part of the consumption and nutrition studies on commercialization of crops and food subsidies, and the

Ghana survey was part of the Living Standard Surveys carried out by the World Bank.

Body Mass Index Trends

Table 8 provides data on individual BMI in the four countries broken down by the BMI categories suggested in James, Ferro-Luzzi and Waterlow (1988). The data is restricted to 15-59 year old population. Excluded from the sample are pregnant and lactating women.
Using the categories suggested, 16.5 percent of women in Ghana are classified as having low BMI (below 18.5) and in their terminology--women with chronic energy deficiency. This is significantly lower than Ghanaian men (23.4%). The trend across gender in the Philippines show a different pattern. There are more women in the low end of BMI scale compared to men (22.2% versus 25.9%). Kenyan women on the other hand, show the lowest prevalence of low BMI among the sample countries, at only 6.4 percent. In the data reviewed here, Pakistani men showed the highest proportion of low BMI at 29.1%. It should be stressed, however, that samples in Pakistan, Philippines, and Kenya were drawn from rural areas--whereas, Ghana was a national sample.

Figures 3 and 4 show low BMI trends across income classes. It is evident that the pattern is non-linear. The income effect is more dramatic in the Pakistan sample:

Low BMI varied across income groups. The general pattern seems that the proportion of men and women that are likely to fall below the 18.5 BMI cut-off declines as income increases. It is most clearly shown in the case of Pakistan males. This pattern does not appear to

Table 8 BMI Categories (15-59 years old)

	Philippines		Pakistan	Ghana		Kenya
BMI Categories	Male (N=603)	Female (N=461)	Male (N=919)	Male (N=3060)	Female (N=3263)	Female (N=1063)
			(percent)			
Below 16	2.0	3.9	4.7	3.9	1.8	0.2
16.1 - 17.0	3.5	3.5	5.5	4.9	3.0	0.6
17.1 - 18.5	16.7	18.5	18.9	14.6	11.7	5.6
18.6 - 23.0	70.0	55.5	57.5	64.2	59.4	57.9
23.1 - 30	7.6	18.2	13.3	12.3	21.4	34.0
Above 30	0.2	0.4	0.1	0.1	1.7	1.7

hold in Kenyan women however (Figure 3) whose trend over the income range do not vary significantly. As noted in the earlier section the time allocation patterns in Kenyan women tend to be different from that of say, Philippine women. Kenyan women spend nearly twice as much time in activities in home production activities (getting fuelwood, fetching water, cleaning) as are women in the Philippines.

It is also interesting to note that the incidence of low BMI across income groups in Ghana is also flat, perhaps reflecting similar conditions in Kenya. The levels of low BMI in Ghana, however, is about twice that in Kenyan women. In contrast, low BMI prevalence in Ghanaian men falls with increasing incomes.

The impact of age and aging on low BMI is clearly shown in all the four countries. It is also shown to be non linear. At age 15 to 30, populations with low BMI is higher than in the 30-45 age band but increases thereafter.

Morbidity Experience

Self-reported illness experience is used for all of the data sets analyzed for this study. There are disadvantages in using self-reported diagnosis of illness. Possibility of systematic bias has been cited in some studies in labor supply literature (King and Rozensweig 1991). Unlike clinical diagnosis, self reporting of illness suffer in terms of accuracy because the perception of being ill is, in many societies, a relative question--for example the poor may not report themselves as sick although they are not feeling well; and for some others, even mild symptoms are reported as illness.

Fig 3-- Proportion Below 18.5 BMI
by Income Groups

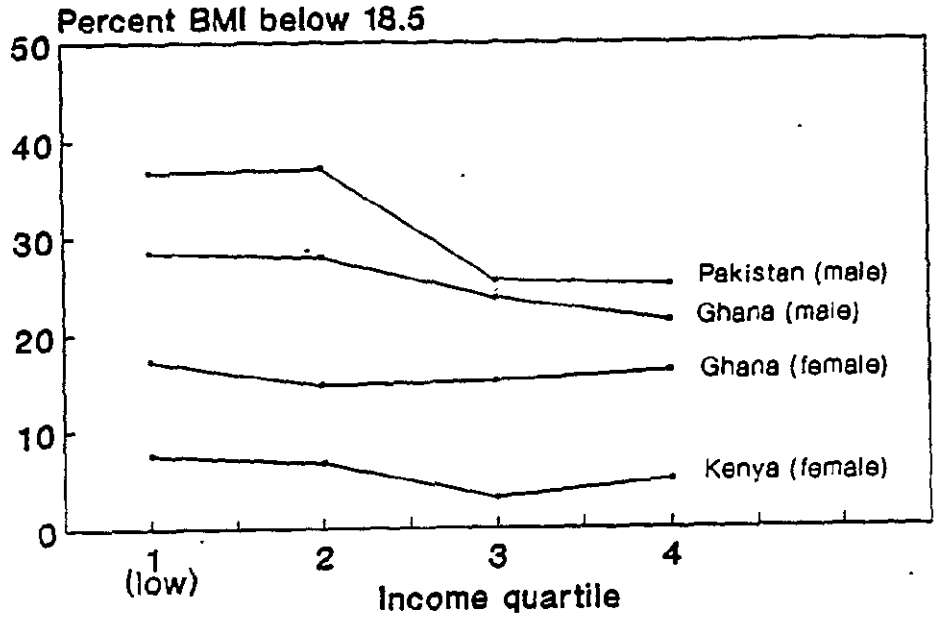
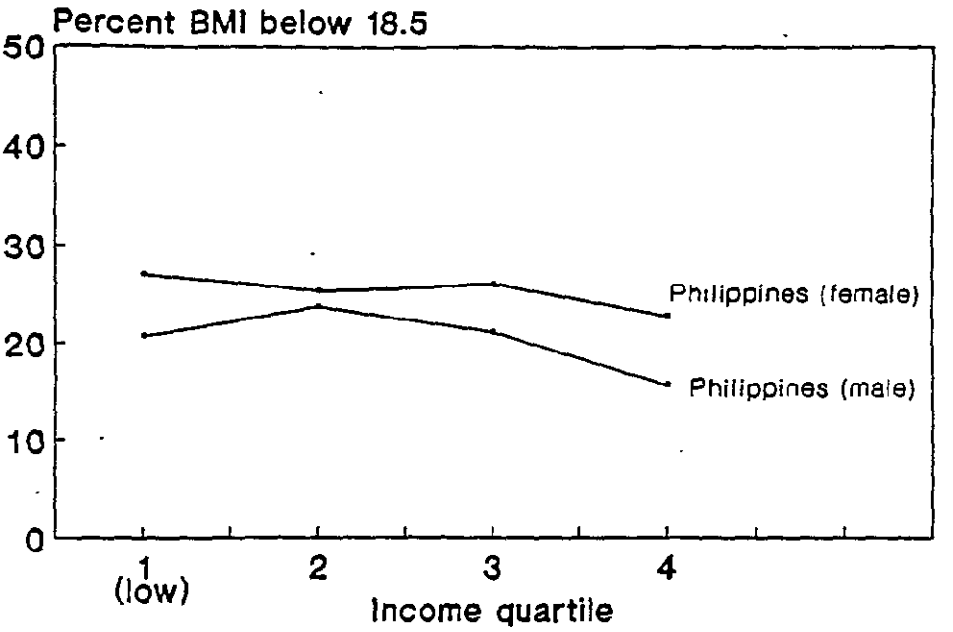


Fig 4-- Proportion Below 18.5 BMI
by Income Groups



While self-reported morbidity status is only a second best solution, there are features in the data used for this analysis that are can internally check the validity of morbidity experience. In three of the four data sets, measurements were done four times during the year (six times in Pakistan). With the multi-period observations of reported illness experience, one can get at the probability of illness and the predisposition of individuals to illnesses.

In comparing the results from various countries, one should note some differences in the definition of morbidity in each of the surveys. The recall period for the Philippines and Kenya is two weeks and for Ghana four weeks. For all three surveys, the morbidity variable is defined as "days ill" in the past period. In the Pakistan survey, morbidity is defined as "days unable to work due to illness" in the past eight weeks.

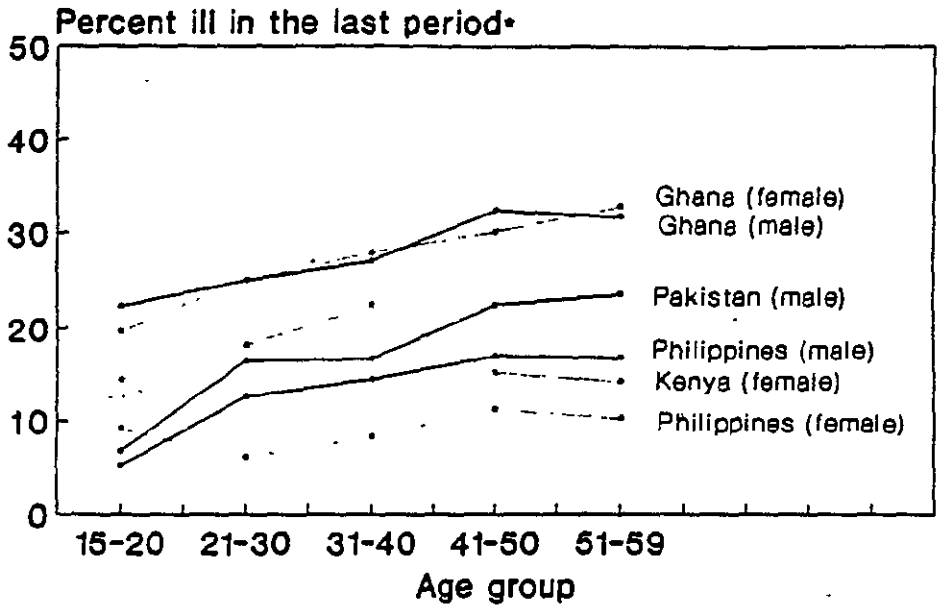
Illness patterns in the sample are shown in Table 9 and Figure 5 age groups and by gender. In the Philippines, the reported illness among older males are higher than older females. Men under 20 however do report lower rates of morbidity compared to under 20 females. The differences in illness between men and women in Ghana however are not significant in either young or older cohorts. The Philippine sample includes sugarcane and maize farmers in rural areas whereas the Ghanaian sample cover both urban and rural populations. In all the four countries examined, morbidity increases with age. Men in their forty's in Pakistan for example are three times as likely to be sick compared to men in their late teens, while Philippine men in their thirty's are three times more prone to illness compared to men in

Table 3 Illness ... ern by gender and age group

Age group	Ghana				Pakistan	
	Male		Female		Male	
	Percent reporting illness in last 4 weeks	Duration if >0	Percent reporting illness in last 4 weeks	Duration if >0	Percent reporting illness in last 8 weeks	Duration if >0
	%	Days	%	Days	%	Days
15-20 yrs old	22.3	6.2	19.6	7.0	6.7	7.7
21-30 yrs old	25.1	7.0	25.1	7.1	16.5	7.1
31-40 yrs old	27.2	7.7	28.1	7.9	16.7	9.3
41-50 yrs old	32.5	9.1	30.2	8.5	22.4	7.5
51-59 yrs old	31.8	9.0	32.9	9.5	23.6	10.5

Age group	Philippines				Kenya	
	Male		Female		Female	
	Percent reporting illness in last 2 weeks	Duration if >0	Percent reporting illness in last 2 weeks	Duration if >0	Percent reporting illness in last 2 weeks	Duration if >0
	%	Days	%	Days	%	Days
15-20 yrs old	5.2	5.5	9.1	5.2	14.4	4.3
21-30 yrs old	12.6	6.3	6.1	6.8	18.2	3.7
31-40 yrs old	14.5	7.0	8.3	7.3	22.5	4.5
41-50 yrs old	17.0	6.7	11.2	6.5	15.2	4.8
51-59 yrs old	16.7	6.3	10.2	6.3	14.2	4.7

Fig 5-- Illness Pattern by Gender and Age Group



• Philippines/Kenya (2 weeks)
Ghana (4 weeks), Pakistan (8 weeks)

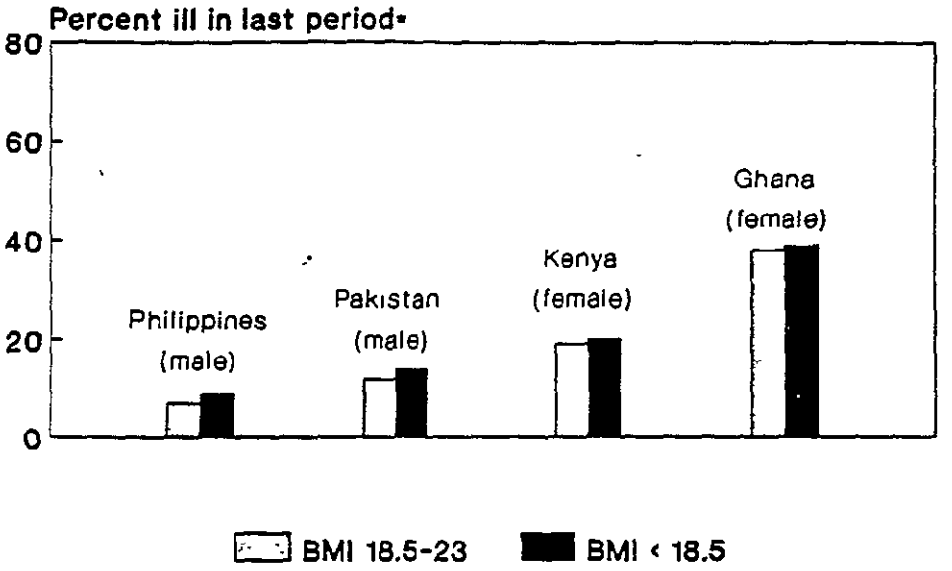
their late teens. The data also suggests that the rise in morbidity with age is much steeper amongst men than women in all the countries--suggesting higher likelihood of illness among men in all the sample countries.

The rise in morbidity as populations get older is in line with the observed mortality patterns in both developed and developing countries. For example, in Mexico it was found that mortality rates of males from all causes in 1986 rises from 186 per 100,000 for the 25-34 age group to 490 per 100,000 for the 35-44 age group (ACC/SCN 1992). It is also noted that deaths among females in those two age groups are twice less than that of men. Epidemiological studies also indicate that the causes of death as population gets older shifts from deaths due to infectious diseases to that of deaths due to chronic non-communicable diseases (Lopez 1990).

Correlation Between Low BMI and Morbidity

The association between low levels of BMI and illness is examined in Figure 6. We use the BMI cut-off of 18.5 for purposes of expressing low BMI rates as put forward by James, Ferro-Luzzi and Waterlow. Figure 6 looks at the morbidity status for two groups of individuals: those falling below 18.5 BMI and those what is termed as normal BMI (18.5 to 23). Clearly, those individuals with BMI above 24 excluded to control for confounding by morbidity risks due to obesity. Results of this bi-variate analysis indicate

Fig 6 -- Probability of illness
by BMI category



*Philippines/Kenya (2 weeks)
Ghana (4 weeks), Pakistan (8 weeks)

that the probability of being sick does not vary substantially between those with low BMI and those which are considered to be 'normal'. The differences are not statistically significant in all of the countries examined. In only one case (in Philippine males).

The relationship between low BMI and duration of illness is examined in Figures 7 and 8. The results indicate that the probability of an individual to fall below the 18.5 cut-off BMI does not vary significantly with duration of illness in all cases except for the males in Pakistan where the prevalence of low BMI tend to rise for men who were sick for more than 12 days in the preceding four week period.

It is likely that the bivariate results are confounded by many factors, including income, age, energy expenditure and activity levels. It is for this reason that a multiple regression analysis is more useful in drawing the direction and size of the relationships between morbidity and low BMI.

To test the probability of being malnourished (below the 18.5 BMI cut-off), a set of regressions were run. The dependent variable in this equations is the dummy variable which takes the value of one if BMI is below 18.5 and zero otherwise. The model is run excluding those above 24 to control for the confounding by disease risk factors associated with obesity. As noted earlier, the problem of circularity in the BMI-illness causation should be considered in the model. This implies that OLS is not suitable for the estimation of the illness coefficients. In this paper, we will attempt to mitigate any possible covariances of low BMI and illness by using instrumental variables (two-stage least squares) estimation procedures. In order to compare

Fig 7--Probability of low BMI in adults by illness days in last 8 weeks

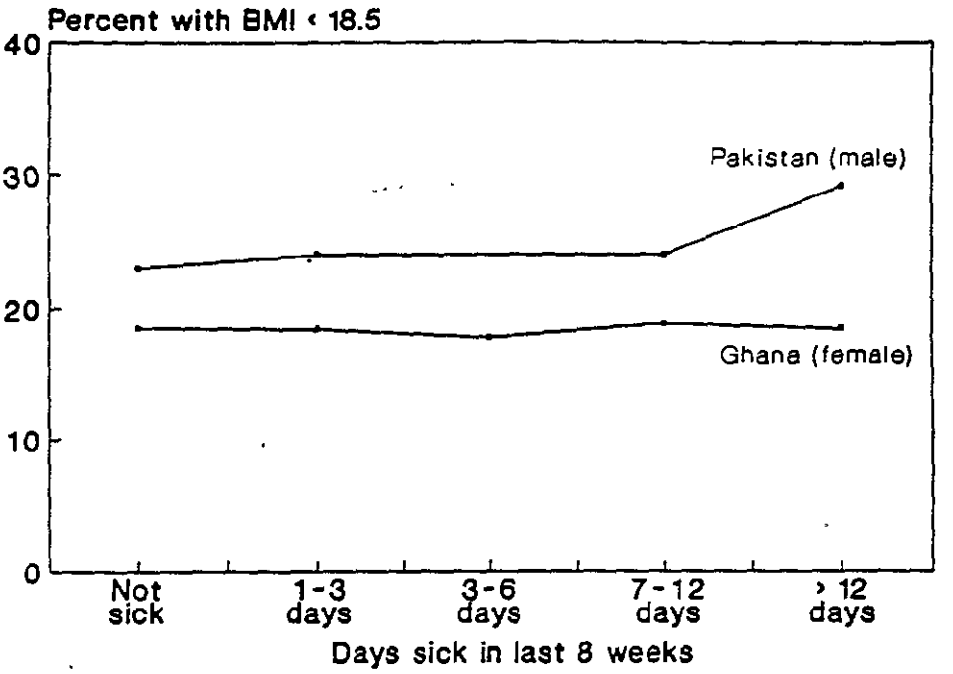
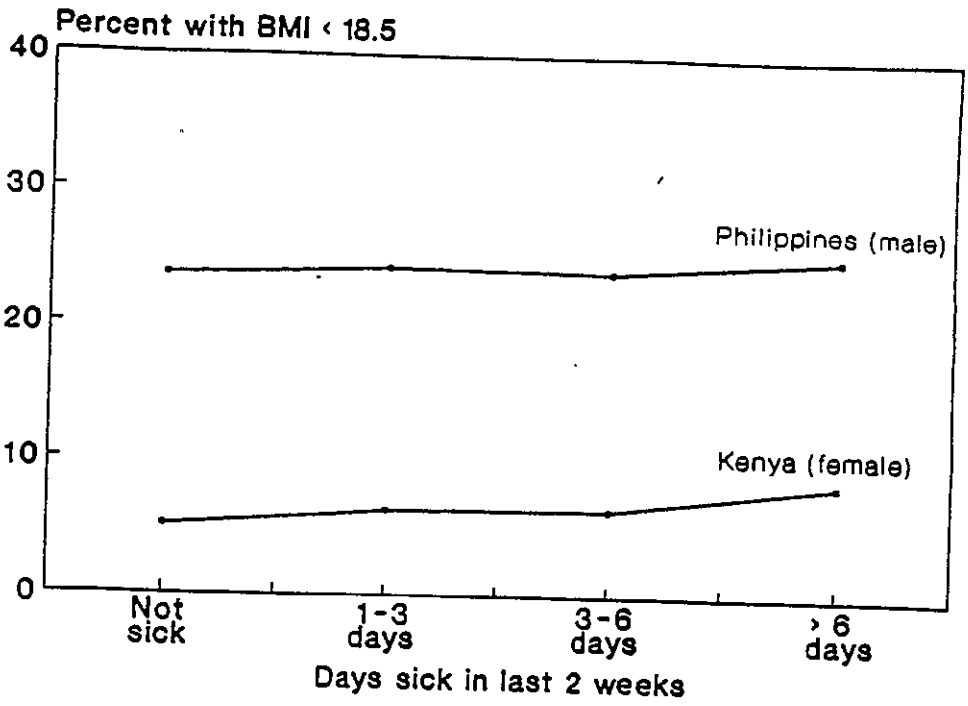


Fig 8-- Probability of low BMI in adults by illness days in last 2 weeks



the range of various sources endogeneity, we also modeled using OLS estimates which would permit an examination of the unadjusted illness effect on BMI.

The instrumental variables used to predict illness in the first stage of the regressions includes: income measured by per capita expenditures, household size and composition, potable water and sanitation facilities and education. Morbidity is the result of many factors including exposure to pathogens and parasites and by availability and quality of health services. A community level variable--called community illness is used as an explanatory instrumental variable in order to control for the fact that community pathogens are one of the potential causes of illness and infections. This is calculated as the mean illness prevalence of the village where the individual resides--and is estimated excluding the individual in question. The procedures for this have been found to be useful in the analysis of the nutrition of children (Alderman and Garcia 1992).

The main results using probit regressions (maximum likelihood probit estimates) is found in Table 10. After controlling for simultaneity, the model predicts moderate statistical significance of the morbidity variables in Pakistan and Kenya but not in the Philippines and Ghana. This implies that at least in the environment in Pakistan and Kenya, that low BMI predisposes individuals to illness. The size of the coefficients in Pakistan is much larger than in Kenya implying a stronger effect of illness than in Kenya. It must be noted that earlier analysis by Kennedy (1989) using OLS on the same Kenyan data shows the strong impact of low BMI on illness. The

Table 10 Probit regressions: Probability of low BMI (<18.5) in adults 15-59 years old

(Maximum likelihood probit estimates)

	Pakistan (male)	Kenya (female)	Ghana (female)	Philippines (female)
Intercept	0.4921 (9.98)**	0.2833 (1.92)*	0.5521 (7.74)**	0.9056 (4.12)**
Expenditure per capita a/	-0.0019 (-2.89)**	-0.00027 (-0.32)	-0.00023 (-2.51)**	-0.0054 (-0.89)
Age	-0.0451 (-3.46)**	-0.0018 (-2.51)**	-0.0250 (-5.75)**	-0.0371 (-2.77)**
Age, squared	0.0721 (2.01)**	0.0029 (2.61)**	0.0037 (6.38)**	0.0049 (2.70)**
Days ill in the last 2 weeks a/	0.0217 (2.01)**	0.0068 (1.68)*	0.0019 (0.28)	0.0010 (0.81)
Household size		-0.0062 (-2.22)**	-0.0020 (-0.70)	-0.014 (-1.76)*
Energy expenditure		-0.0008 (-2.60)**		
Sex of household head		0.0170 (0.96)		
Percent pre-school children		0.0022 (2.49)*	-0.0081 (-0.14)	
Number of observations	919	1063	2145	461

Notes: * Significance at 10% level
** Significance at 1% level
T-values are in parentheses
a/ Endogenous right hand side variables
Pregnant and lactating women are excluded from sample

recalculation of such effects using the instrumental variable approach here indicates that the strength of such relationships diminishes, although still clearly statistically significant. This results implies that after controlling for the two-way causation, that indeed the probability of low BMI could potentially predispose one to morbidity.

No such relationships are found in the Philippines and Ghana. The findings in the Philippines confirms results by Bouis and Haddad (1989) on the same Philippine households which found that BMI is not a good predictor of agricultural productivity in that environment. On the other hand, height was found to be more strongly associated (positively) with wage rates. The results for Ghana show a much lower level of significance compared to those estimated by Higgins and Alderman (1992) using a different approach. The direction of causality in the present study is, however, in line with their study.

The regressions in Table 10 also provides some explanations for the probability of low BMI. The age variable is significantly negative for all the countries under study- and it is also clear that the age effect is not linear as indicated by the quadratic term for age. This implies that low BMI declines as one advances to around 35 then rises thereafter. In larger households, there is tendency for higher proportions of low BMI which is probably in keeping with the expectations that resources per capita (food or health care) are lesser in bigger families. The presence of more pre-school children in Kenya also predisposes the Kenyan women to low BMI. Higher incomes

also reduces the probability of low BMI, and it is strongly associated in Pakistan and Ghana.

The analysis from four countries has shown a mixed result with respect to the issue of the impact of low BMI on morbidity of individuals. It is likely that many unobserved factors that affect the propensity of morbidity from being thin (of having low BMI). One of the important pathways that is difficult to model is the impact of activity level, as well as the role of community pathogens and infectious disease patterns which are outside the control of households and the individuals. It is clear from the modelling used here that circularity of causation is recognized.

One of the main concerns from this empirical investigation is the utility using the 18.5 cut-off BMI for diagnosing chronic energy deficiency. It seems reasonably clear that the thresholds at which morbidity begins to rise is not generally consistent with this cut-off at least in the types of households depicted in the present analysis. The cut-off appears to meaningful only in the case of Pakistan, but even here the size of the relationships are quite small although statistically significant.

E. Household Structure and Women and Children's Nutritional Status

A number of the case studies in Volume II examined the issue of household structure and effects on women's and children's nutritional status. As outlined in one of the background papers prepared for this project (Kennedy 1992) an increasing number of households in both developing and developed countries are headed by women. There is a

concern on the part of policy makers that these women-headed households are poorer and potentially less likely to be helped by development policies. A number of the case studies in this volume, thus, attempt to examine the effects of specific development policies on female-headed households.

Several of the case studies--Kenya, Malawi, Ghana LSMS and Dominican Republic--attempt to identify an expanded definition of the term "female headed household". As pointed out by the chapter by Peters on Malawi in this volume the tendency to treat female-headed households as a homogeneous entity has marked differences which exist across the categories of female-headed households. Summary data for Kenya, Ghana and Malawi provided in Table 11 indicate that the relationship between household income and gender of head of household is mediated in part by the type of female-headed household.

For Kenya, a simple comparison between male-headed and the all-female head of household category shows that income per capita is significantly higher for male-headed households. However, when female-headed households are disaggregated in *de jure* and *de facto* female-headed households,[3] a different pattern emerges. There is no significant difference between male- and *de jure* female-headed household in income per capita. However, *de facto* female-headed

[3] *De jure* defined as legally defined head; *de facto*, in practice the head. For the purposes of studies used here *de facto* is defined as male head of household absent for more than 50 percent of the time.

Table II--Demographic characteristics and expenditure patterns of households in Kenya, Malawi, and Ghana

Country/ Household Type		Demographic Characteristics		
		Household Size	Dependency Ratio	Expenditures per Capita[a]
Kenya[b]				
Males		9.55	1.23[c]	2,854.0[c]
Females:	Total	9.10	1.34[c]	2,561.0[c]
	De jure	8.62	1.24	2,736.0
	De facto	10.09	1.54[c]	2,200.0[c]
Malawi[b]				
Males		6.26	1.28	81.1[c]
Females:	Total	5.64	1.76	71.7[c]
	Migrants	6.21	2.49	114.1
	De jure	5.10	1.55	63.5[c]
	De facto	5.90	1.68	59.7[c]
Ghana[d]				
Males		6.92	1.28	44,201.0
Females:	All females	5.29	1.81	43,115.5
	De jure	5.31	1.83	43,181.0
	De facto	5.31	1.52	45,352.0

[a] In Kenya shillings (per annum) for Kenya; kwacha (per 10 months) in Malawi; and cedis (per month?) for Ghana.

[b] Taken from Kennedy and Peters (forthcoming).

[c] Significantly different than male-headed households at $p < 0.05$.

[d] Taken from Kennedy and Haddad (forthcoming).

households are significantly poorer than male-headed households living in the same community.

The data for Malawi are even more intriguing. Here, similar to the findings for Kenya, male-headed households have a significantly higher expenditure per capita when compared to the category of all-female-headed households. *De facto* female-headed households in the Malawi sample were separated into two distinct groups: the typical *de facto* households and migrant households, where a *de facto* female head is receiving remittances from a male working specifically in South Africa.

However, when one compares the male-headed households to different types of female-headed households, the patterns change. The richest and poorest household types in the Malawi sample are female-headed. The migrant households receiving remittances from South Africa are the wealthiest and the *de facto* are the poorest. Migrant households have expenditures per capita that are significantly higher than male-headed households and the *de facto* female-headed households have income levels that are significantly lower than male-headed households.

The Ghana data in Table 11 indicate that women-headed households are, on average, no poorer than male-headed households. There are no significant differences, on average, between male-headed, *de jure* female-headed and *de facto* female-headed income levels in Ghana.

When one asks the question, "Are female-headed households poorer than male-headed households?", the answer is, not always. However, the data presented in Table 11 represent African case studies only.

It may be misleading to extrapolate findings for female-headed households in Africa to other areas of the world. Several authors have highlighted the fact that female-headed households have had more of a tradition in Africa. Even in sheltered Islamic societies, such as the Hausa in Nigeria, Polly Hill (1969) noted that matrilineal descent patterns led to the existence of independent producers which has historically led to the formation of women-headed households.

Female-headed households which arise as a result of traditional patterns sanctioned by society may be less likely to be poor (CEPAL 1985), such as we see in the migrant households in Malawi, in Ghana, and in some women-headed households in Kenya.

The findings for female-headed households in Latin America and the Caribbean appear to be very different: 13 of the 19 studies summarized in Kennedy 1992 (Appendix II) report that women-headed households were poorer than male-headed households. However, even in this region, there are exceptions to this rule. For example, a study from Jamaica on 6,000 households concluded that there are better proxies for poverty than gender of head of household (Louat, Grosh, and van de Gaag 1991). One should note that in the Jamaica case, 42 percent of the households were female-headed. In many of the studies reviewed here, female-headed households tend to be overrepresented among the poor. This is more true for Latin America and Asia than it is for Africa. In Latin America, poorer female-headed households are more likely to be found in the urban areas, whereas, in Africa, female-headed households are more prevalent in the rural areas.

Because the number of female-headed households has been increasing throughout the developing world and since these households in many cases are poorer, there is a concern on the part of national level policy makers and among donors, that there may be a negative effect on children. Arguments have been made, both pro and con, on the relationship between gender of head of household and child welfare. Most studies to date have used nutritional status as the primary measure of child welfare.

Table 12 presents some of the three country results. In Kenya, preschoolers from male-headed households are significantly more likely to be stunted and have a low weight-for-age when compared to children from the aggregate of all female-headed households. Possibly more surprising is the finding that the lowest income, *de facto* female-headed households have lower levels of preschooler malnutrition (based on weight-for-age) than children from male-headed households; 14.6 percent of preschoolers from the *de facto* female-headed households are moderately to severely malnourished (below -2.0 Z-score for weight-for-age) compared to 18.6 percent of children in male-headed households.

Similar results are indicated for Malawi: in the lowest income, *de facto* female-headed households, weight-for-age less than -2.0 Z-scores is 20.9 percent compared to 28.4 percent in male-headed households. Preschoolers from the *de facto* female-headed households are also less likely to be stunted than are preschoolers from male-headed households.

Table 12--Nutritional status and morbidity of preschoolers

	KENYA[a]				MALAWI[a]					GHANA[b]			
	Males	Females			Males	Females							
		Total	De jure	De facto		Total	Migrants	De jure	De facto	Male	All Female	De jure	De facto
Z-scores:													
Weight-age	-1.07[c]	-0.87[c]	-0.84	-0.91[c]	-1.45	-1.38	-1.53	-1.23	-1.42	-1.15	-1.18	-1.17	-1 24
Height-age	-1.66[c]	-1.41[c]	-1.40	-1.44	-2.41	-2.31	-2.64	-2.16	-2.24				
Weight-height	-0.06	-0.01	0.01	-0.06	0.06	0.05	-0.06	-0.16	-0.04				
Percent with Z-scores less than -2:													
Weight-age	18.6	15.5	16.0	14.6	28.4	23.5	36.0	17.7	20.9	21.9	19 6	19.6	20.0
Height-age	39.9	32.8	33.1	32.1	62.3	55 9	64.0	55.9	51.2				
Weight-height	1.9	4.6	4.5	4.8	0.9	0.0	0.0	0.0	0.0				
Percent of total time:													
Ill	28.63	27.80	27.82	27.75	21.80	22.80	19.00	27.20	21.10				
Ill with diarrhea	4.14	4.00	3.97	4.05	1.84	1.90	1.63	2.39	1.63				
Child/household caloric adequacy	0.66	0.67	0.64	0.72	1.31	1.37	1.19	1.36	1.48				

[a] Taken from Kennedy and Peters (forthcoming).

[b] Taken from Kennedy and Haddad (forthcoming).

[c] Significantly different than male-headed households at $p < 0.05$.

Curiously, preschoolers from the highest income, migrant female-headed households in Malawi do no better nutritionally than children from the male-headed households. It is, therefore, not gender of the head of household per se that automatically imparts this beneficial effect on preschooler nutritional status.

In Ghana, there is no significant difference in the nutritional status of preschoolers from male-headed compared to different types of female-headed households.

These descriptive data lead one to conclude that even in Africa the relationship between headship and preschooler nutritional status is not consistent. We begin to get a hint of an explanation of the findings from the data presented in Table 12.

In Kenya, there is a tendency for children from female-headed households to be sick for a shorter period, including to have shorter bouts of diarrhea; none of these differences are statistically significant.

In both Kenya and Malawi, the proportion of household calories captured by the preschooler is higher in the lower income *de facto*, female-headed households. These findings suggest that, as household income increases, there is not necessarily a direct one-on-one effect on the caloric adequacy of preschooler diets. For example, preschoolers from the migrant female-headed households in Malawi, despite their higher incomes and higher levels of household caloric adequacy, do not themselves have the highest preschooler energy intake nor the best nutritional status compared to children from other types

of households. On the contrary, the proportion of calories obtained by children in these higher income, migrant female-headed households is below even that in male-headed households. This is due, in part, to the types of extra calories acquired, namely meat and other expensive foods, that often do not directly increase preschooler caloric intake. Similarly, in the Kenya example, *de jure* households, whose expenditure levels are about equal to male-headed households, also allocate a slightly lower proportion of total calories to their children than do male-headed households. These findings suggest that, as household incomes increase, there is not necessarily a direct one-to-one effect on the caloric adequacy of preschooler diets.

The reason for the preference of children in the allocation of calories in lower income, *de facto* female-headed households is not clear. It could be that, given limited resources, investment of income in the form of food for children brings the highest return among poorer households' few alternative investment options. By investing in their children, these poorer households may best be able to insure their long-term security. Such an explanation is consistent with the data presented above on the declining share of expenditures to food as incomes increase. It is also consistent with the observation that male-headed households and wealthier female-headed households spend a higher proportion of incomes on other productive assets, such as inputs into cash crop production, including fertilizers. The consumption needs of adult household members and investments in land, hired labor, and other productive resources may compete with children's consumption for a share of the budget in

households where incomes are sufficiently high to allow those additional investments.

An additional explanation for the negative relationship between household income and the proportion of calories going to children may be that, at higher levels of income, money is spent on more expensive calories rather than more calories per se. Children simply may not share proportionately in those additional, more expensive calories. This certainly appears to be the case in the Malawi households. Moreover, failure of an increase in income to positively affect child nutrition may be due to the type and timing of income. The migrant households in Malawi, for example, receive, on average, a much higher income than other female heads, but, one, the lumpiness of remittances may incline the recipients to spend on things other than the daily requirements of preschoolers and, two, migrant remittances may not last more than a few years in some families.[1] Finally, the Malawi study suggests that where cash incomes are higher and where these allow higher levels of expenditure, the resources allocated to appropriate feeding of young children is <u>not</u> proportionately higher. This would suggest that additional efforts have to be made in education and in providing the means (such as more effective weaning foods or energy-efficient cooking technologies) for directing increased incomes towards the vulnerable preschoolers.

Finally, the Kenya example also points to the importance of nurturing behavior in determining the quality of child nutrition. According to a detailed, ethnographic study conducted as part of the Kenya research (Rubin 1988), female-headed households often have a

number of eating occasions for their preschool-aged children. Analyses have shown that a child's caloric adequacy increases in proportion to the number of daily meals (for example, Kennedy 1989).

In the case of *de jure* households, the higher prevalence of disease and lower proportion of calories allocated to children, compared to *de facto* households, may partly reflect the relationship of the household head to the children in the household. In Kenya, and to a lesser extent in Malawi, many of the female household heads in *de jure* households are the grandmothers of children in the household. In terms of the impact on child health and nutrition, the fact that a woman heads the household may be less important than the relationship between the household head and the children in the household. The degree of authority mothers have in decisions over their own children's well-being may have an overriding importance on allocations of income for additional health care or food for children. Intergenerational conflicts over the value of modern health and nutrition practices that limit their adoption may also affect child well-being.

Clearly, it is not female-headedness per se that leads to better nutrition outcomes for children, but the intersection between income and gender of head.

More research is necessary to understand more fully the interactions between income and gender as they affect child health and nutritional well-being. Better information on nurturing behaviors that promote child health, particularly in low income environments, and factors that lead to household investment in their children is also required. Undoubtedly, a clearer understanding of these issues can also improve the design of future agricultural and health policies

toward promoting household food security and child nutrition in the long-term as well.

The findings that it is the children in the lowest income, *de facto* female-headed households that do significantly better than preschoolers from low-income male-headed households is similar to the findings reported for the Dominican Republic (forthcoming in this volume). It was only in the lowest quartile of income that the percent of total household income earned by the mother was significantly associated with children's nutritional status. In the upper three quartiles of income, there was no differential effect of maternal income on preschooler nutritional status.

The studies from Kenya and Dominican Republic suggest that something about distributional patterns of income (and possibly time) at very low levels of income in these female-headed households work to the advantage of the child.

Up until recently, women's nutrition was given attention only as it affected infant and child nutrition. It is only very recently that Maternal and Infant Nutrition has been relabelled Woman and Infant Nutrition by a number of donors. It is not surprising, then, that the amount of information available on the nutritional and health status of nonpregnant, nonbreast-feeding women is limited. The data available on the relationship between gender of head of household and women's nutrition is almost nonexistent.

Earlier work conducted at IFPRI (Kennedy 1993) had shown that there was no significant relationship—either positive or negative—between household income and women's nutritional status as measured by body mass index.

ome nutritional us data disaggregated by gender of head of household are presented for women in Kenya (Volume II). Nutritional status as measured by body mass index (BMI) is significantly higher for women in the all female-headed households combined compared to women from male-headed households. Women in *de jure* and *de facto* headed households (all income terciles combined) have a higher BMI than women from male-headed households. These differences are not significant but part of this is driven by the small sample sizes in some of the cells.

As shown in Table 13 neither household income per capita or gender of head of household alone has a significant association with women's nutritional status. The interaction of *de jure* headed household and income has a significant, positive effect on women's nutritional status.

Presence in a *de facto* female-headed household does not have a positive effect on women's nutritional status. Part of the explanation is the level of energy intensity of women's activities as shown in Table 14. In male-headed and *de jure* female-headed households, as household income increases, the energy expenditure of women decreases. This is a phenomenon commonly observed. However, in the *de facto* female-headed households, as household income increases, women continued to have a high level of energy expenditure. Women's time spent in work is significantly higher for women from *de facto* female-headed households compared to women from *de jure* female-headed households in the middle income tercile.

These issues need further analyses but point again to the importance of not treating female-headed households as a homogeneous entity.

Table 13--Determinants of women's body mass index (BMI)

Variable	B	T
Hou[illegible]	-.023691	-.905
De facto fe[illegible]eaded household (1=Yes)	.580586	.645
Married (1=Yes)	-.273111	-.555
Number of live births	.097330	1.405
Household income per capita	-4.84993E-05	-.704
Percent total time ill	-.018532	-2.955
De jure dummy x household income per capita	3.700271E-04	2.078
Mother's schooling (years)	.109778	2.895
Polygamous household (1=Yes)	-.173588	-.594
De facto dummy x household income per capita	1.198757E-04	.491
Age (months)	-6.88472E-04	- 324
De jure female-headed household (1=Yes)	-.710198	-1.081
Constant	22.829892	25.713
R^2	.051	
F =	2.52	
Sig. F =	.003	

Table 14 --Selected women indicators, by gender of head of household, by household income/capita tercile (1=lowest tercile)

Indicator	Male	Female	All Female		All
			De jure	De facto	
Body Mass Index					
1	22.41	22.84	22.45	23.44	22.49
2	22.12	22.40	22.70	21.67	22.16
3	22.13	22.89	22.70	23.68	22.25
All terciles	22.21[a]	22.72[a]	22.62	22.94	22.30
N	819	174	122	52	993
Total energy expenditure/day					
1	2,562.12	2,561.94	2,554.48	2,573.59	2,562.08
2	2,552.82	2,573.57	2,556.90	2,623.61	2,556.49
3	2,498:19	2,498.96	2,459.88	2,676.59	2,498.33
All terciles	2,538.02	2,546.98	2,523.31	2,606.35	2,539.73
N	879	207	148	59	1,086
Percent total time ill					
1	18.82[b]	21.62	25.28[b]	17.54	19.44
2	23.81[b]	18.55	11.58[b]	29.20	23.01
3	23.27	23.65	21.95	29.98	23.33
All terciles	21.96	21.38	20.43	22.97	21.85
N	786	176	110	66	962
Nonleisure time (hours/day)					
1	10.41	10.61[b]	10.84[b]	10.23	10.45
2	10.49	10.44	9.99[c]	11.80[c]	10.48
3	10.05	9.34[b]	9.00[b]	10.96	9.93
All terciles	10.32	10.19	9.95	10.81	10.30
N	947	219	159	60	1,166
Percent share of income					
1	29.93[b]	38.62	42.81	34.75	31.64
2	27.72	34.86	37.63	31.12	28.79
3	22.12[a,b,c]	45.78[a]	60.14[c]	28.22[c]	24.23
All terciles	26.68[a,b]	38.56[a]	44.02[c]	32.47	28.44
N	644	112	59	53	756

Source: IFPRI South Nyanza Survey 1985/87.

[a] The difference between male- versus female-headed household within tercile group is significant at the 0.05 level.

[b] The difference across terciles within each gender of head of household category is significant at the 0.05 level.

[c] The difference from among male-, de jure female-, and de facto female-headed household within each tercile group is significant at the 0.05 level.

Given the difference observed for Africa and Latin America when examining child level health and nutrition outcomes, one might expect a very different association between gender of head of household and women's nutritional status. Clearly this is an area that needs attention.

ENDNOTES

1. Recruitment of migrant workers for South Africa has now been stopped by the Malawi Government. A current study being undertaken by Peters of the same Malawian households as described in this article will be able to assess what effects this change has had on income and consumption of the former migrant households.

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WORKSHOP ON "THE EFFECTS OF POLICY AND PROGRAMS ON WOMEN"

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
8th Floor, 1776 Massachusetts Avenue, N.W.
Washington, D.C.

AGENDA

January 16, 1992

Chairperson: Naila Kabeer, Institute of Development Studies, Sussex

9:30 A.M. - Welcome

Just Faaland, Director General, IFPRI

Richard Seifman, Director, Office of Nutrition, AID

9:45 A.M. - Overview of Workshop

Eileen Kennedy - IFPRI and Marito Garcia - IFPRI/ACC-SCN

10:00 A.M. - Trends in Women's Nutritional Status and Implications for Public Policy

Marito Garcia - IFPRI/ACC-SCN

Discussant: Peggy Bentley, Johns Hopkins University School of Hygiene

Open Discussion

11:15 A.M. - Gender, Economic Adjustment and Reform: Theory versus Evidence

Lawrence Haddad - IFPRI

Discussant - David Sahn, Cornell University Food and Nutrition Policy Program

Open Discussion

12:30 P.M. - Lunch at IFPRI

Chairperson: Kalanidhi Subbarao, The World Bank

1:30 P.M. - Effects of Gender of Head of Household on Women's and Children's Nutritional Status

Eileen Kennedy - IFPRI

Discussant - Pauline Peters, Harvard Institute for International Development

Open Discussion

2:45 P.M. - Synthesis of Papers, Future Research Needs and Analytical Approach

Open Discussion

4:00 P.M. - Plans for 1993 Conference

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EFFECTS OF SELECTED POLICIES AND PROGRAMS ON WOMEN'S HEALTH AND NUTRITIONAL STATUS

VOLUME II
CASE STUDIES

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Zohra Lukmanji
L. Magambo
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EXECUTIVE SUMMARY

This is the second volume in a two volume series that deals with the effects of selected policies and programs on women's nutritional status. The first volume of the series contains the synthesis of the series of 12 case studies. This volume contains each of the individual case studies and will be useful for those who wish to explore the original case study findings.

Throughout their life women are vulnerable to malnutrition for both social and biological reasons. In many parts of the world - particularly in South Asia - girls are discriminated against in access to food, health care and education. The long work hours and multiple roles of women result in general undernutrition.

However until recently the issue of women's nutritional status has been ignored. Thus little is known about the nutritional status of non pregnant, non lactating women. The data summarized on women's nutritional status in volume I was gleaned primarily from sub-national level studies. Few on-going monitoring and evaluation systems routinely collect data on women's nutritional status.

Malnutrition continues to be a problem for a large proportion of the female population in the developing world. In South and Southeast Asia approximately 40% of the women surveyed have a body mass index (BMI) less than 18.5 (a sign of thinness) and in Sub-Saharan Africa 20% fall below this cut-off. In addition, anemia is widespread. In Africa, 42% of women were classified as anemic and in South Asia, the prevalence of anemia is 69%. The proportion of non pregnant, non lactating women who are anemic has not changed over the past 20 years despite substantial attention given to the problem.

The purpose of this volume is, in a variety of socio-cultural settings, to summarize what is known about women's nutritional status, the effects of selected development policies and programs on health and nutritional status and using this information to identify types of policies and program which offer the potential to improve women's nutritional status.

Twelve case studies representing nine countries are contained in this volume. Volume One of this set synthesized information from the individual case studies. This volume contains the individual twelve case studies. Some general themes emerged from the individual case studies.

A basic assumption in many of the economic development policies that have been pursued by developing country governments is that the particular policy will increase household welfare. This usually translates into the expectation that household income will increase and, in turn, food security and nutritional status will also improve.

A number of the case studies in this volume trace the household income/women's nutritional status links. There are inconsistent findings on the influence of income on women's BMI. The net effect of increased household income on women's nutritional status is modified by the indirect effect of policies on the energy intensity of women's time allocation patterns. For example, in Malawi (Chapter III) there is no difference in the first and second terciles of income in women's BMI. It is only in the highest income tercile that women's nutritional status appears to improve.

Some similar findings emerge from Kenya (Chapter I). Women's BMI is not responsive to increasing household income and as the proportion of women controlled income increases, the BMI of women decreases. Both the Malawi and Kenya cases suggest that increasing household income without simultaneously decreasing the energy intensity of a woman's activities will have minimal effects on improving women's nutritional status.

Where women's and men's time data are available the studies suggest that women have a longer work day compared to men. It does not appear to be total work time per se that has a negative effect on nutritional status but particular energy intensive types of activities. For example, in one of the Ghana case studies (Chapter V) time devoted to domestic activities and time devoted to agricultural work had a negative association with women's nutritional status. These are the two categories of activities within the women's work day that are the most energy intensive.

Similarly in Kenya (Chapter I) it was the time devoted to agriculture that had the most negative effect on women's BMI.

Many of the case studies indicate that at all levels of income women continue to be physically active. This creates a particular problem during pregnancy where reproductive needs compete with other productive activities. The cases in this volume on Tanzania (Chapter XII), Kenya (Chapter I) and Malawi (Chapter III) indicate that women's work load during pregnancy changes hardly at all. This is due in large part to the lack of a labor substitute for women's domestic production activities such as time for fuelwood and water collection.

The problem seems particularly severe in the Sub-Saharan African cases. In contrast, in one of the Philippines case studies (Chapter II), physical activity decreased for women in the highest income cash cropping households during the last trimester of pregnancy, resulting in higher birthweight infants.

A number of the studies in this volume examine the issue of gender of head of household on women's and children's nutritional status. First it is clear from the studies in Dominican Republic (Chapter XI), Malawi (Chapter III), Kenya (Chapter I) and Ghana (Chapter VI) that the definition of female headed household influences interpretation of results. A simple comparison of male versus all female headed households combined, obscures many of the subtleties of different types of female headed households.

Not all female headed households are alike and maybe more surprisingly, not all female headed households are poorer than male headed households. In the Malawi case, female headed households are the richest and poorest in the sample.

At very low levels of income some types of de facto female headed (male absent households) have children who are better nourished than children from higher income, male headed households. Several factors appear to account for this. First, a higher percentage of calories are allocated to preschool aged children in these households. Secondly it appears that the time devoted to nurturing behaviors is different in these lower income, female headed households. This mother/child interaction changes as household income increases. Time demands on women appear to change.

It is not female headedness per se that imparts this beneficial nutrition effect on children since not all types of female headed households show these results. In fact, in the highest income, migrant female headed households in Malawi, preschool aged children are worse off nutritionally than other types of households. Peters (Chapter III) gives one explanation for this apparently contradictory finding. In the female headed, migrant households, although a higher absolute amount of money is spent on food, it is used to purchase "adult foods" which do not in this case benefit the young child. This patterns of purchasing more expensive, prestige foods, as income rises is found in both male and female headed households.

In the past a lot of attention has focused on the food linked and morbidity linked malnutrition in children. However in the case studies in this volume, the issue of nurturing activities or "caring" comes out as a subtle issue. In some of the case studies, income is not an adequate substitute for time. The Philippines case study (Chapter II) comes to the conclusion (indirectly) that mothers market place involvement decreases the quality of child care. In the Tanzania case (Chapter XII), it is the mother/child time and interaction that seems to be a critical variable in decreasing malnutrition in young children. This caring variable is not fully understood and unfortunately has only begun to be examined.

The Tanzanian study (Chapter XII) states that in the past there was often the implicit assumption that " what was good for the child was good for the woman." This appears often not to be the case. A number of the case studies which document a positive effect of female

headship on preschool nutritional status, fail to show the same effect on women's nutrition. In Malawi (Chapter III), children from de facto female headed households tended to have the best nutritional status at low levels of income. However women's BMI was the worse in these same de facto female headed households. The same is shown for the Kenya data (Chapter I); women in the lowest income, defacto female headed households had the poorest nutritional status.

Haddad in the Ghana case study (Chapter VI) uses the term "shock absorbers" to describe the tendency for women to sacrifice their own nutritional needs for those of their children. Increases in income seem to benefit the child before the woman. This buffering capacity of women can only be taxed so far. At some point women's nutritional status can no longer be protected and this may be why the Ethiopian case (Chapter IX) shows a negative effect of number of dependents per productive adult on women's nutritional status.

A number of the cases note that illness seems to have a levelling effect on the income/nutrition links in both women and children; the positive effects of increases in income on nutritional status are offset in many of the study sites by the heavy morbidity loads in individual women and children. With some types of nurturing behaviors in female headed households, the negative influence of illness on nutritional status is counteracted. Here again, very little information is provided on the specific types of time intensive behavior which seem to offset the negative consequences of morbidity.

One would expect high morbidity levels in poor countries such as Malawi and Tanzania. However in middle income developing countries

such as Dominican Republic (Chapter XI) rates of illness in children are also high. It would be useful to have more information on what public and private investment strategies in health and hygiene are most effective in changing this morbidity profile. The Tanzania case study (Chapter XII) notes that malnutrition and mortality continue to be a problem in the study area despite a ten year history of direct nutrition and health intervention. The authors go on to observe that the availability of women's time appears to hamper participation of children and women in some of these targeted interventions. This has implications for how interventions may need to be revamped.

There is also a seasonal trend noted for women's nutrition in a number of countries. In Ethiopia (Chapter IX) and Malawi (Chapter III) for example there are swings in women's BMI. Although there is some rebounding of the BMI in the post harvest period in Ethiopia, the catch up in weight gain is not complete and thus the study reports a phenomenon of a downward cycle of women's nutritional status.

In many of the African studies there is little seasonality in women's activity levels. Thus women are active most of the time, although the particular activities contributing to this vary somewhat.

A number of the cases in this volume examine methodological issues. The Guatemala study by Immink (Chapter IV) has very detailed information on different methods of measuring men's and women's nutritional status. The study concludes that in some populations BMI may not be the most appropriate measure of undernutrition in adults. This finding has important implications because it means that undernutrition may be underestimated.

Several of the cases provide detailed data on the implications of various definitions of female headed households. A general conclusion from the Rogers work on Dominican Republic (Chapter XI), the Peters work on Malawi (Chapter III), the Kenya study (Chapter I) and the Engle Guatemala case study (Chapter X) is that how we define the household and the specific definition of female headed household will influence our policy conclusions. One clear message is that not all female headed households are the same nor are all female headed households poorer than their male counterpart. The Guatemala study (Chapter X) also provides one of the few examples where research has been able to trace the effects of women earned and male earned income on child nutrition. Not surprisingly Engle reports that both male and female earned income are important for producing different types of health and nutrition outcomes. Women who have earned income in Guatemala appear to have a greater degree of household decision making. This empowerment translates into health and nutrition benefits for children in the household.

A recurrent theme throughout many of the case studies is the need to develop a set of indicators which allow monitoring of health and nutritional status. The Philippine's study by Garcia and Canteras (Chapter VII) indicates that household level variables are not good for measuring women's nutritional status. Similarly, for children, the Dominican Republic case (Chapter XI) suggests that household calories are a poor proxy for children's nutritional status. More thought needs to be given to the issue of how individual risk of poor

health and nutrition can be monitored with more aggregate level measures.

A number of the case studies directly address the issue of policies and programs that offer high potential for improving women's nutritional status. While the particular approaches differ, each intervention seems to combine a strategy of income generation (some targeted to women) done in a way that relieves women's time constraint. This is particularly critical given that many of the macro economic adjustment programs put into place in the 1980s appear to require a greater time commitment of women (Haddad, Chapter VI).

The last message emerging out of a number of the case studies is that development activities often affect men and women differently. This need not be bad but clearly needs to be understood prior to embarking on large scale policies or programs. The implications of alternative approaches for policies and programs and for their effects on nutritional status must be better understood from the inception of an intervention in order to avoid negative health and nutrition effects.

Chapter I.1

THE EFFECTS OF THE COMMERCIALIZATION OF AGRICULTURE ON WOMEN'S CONTROL OF INCOME AND HEALTH AND NUTRITIONAL STATUS: THE CASE OF SUGARCANE IN KENYA

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INTRODUCTION

The commercialization of agriculture--commonly called cash cropping--has been an important component of structural adjustment policies advocated for many developing countries. Policymakers see the increased production of cash crops/export crops as one means of generating foreign exchange earnings, increasing the income of small landholders and improving the incomes of the rural poor.

However, critics of accelerated cash crop production have argued that in many cases the economic benefits have not materialized. In addition, there is the further concern that even in households where incomes have increased some individuals within these households have been adversely affected. A number of authors have indicated a particular concern about the effects of cash crop production on women (Tinker 1979).

The present chapter derives from a larger study to evaluate the effects of shifting from maize to sugarcane production on smallholders in Southwestern Kenya, and assesses the effects of the commercialization of agriculture on women's control of income and women's health and nutritional status.

Chapter I.2

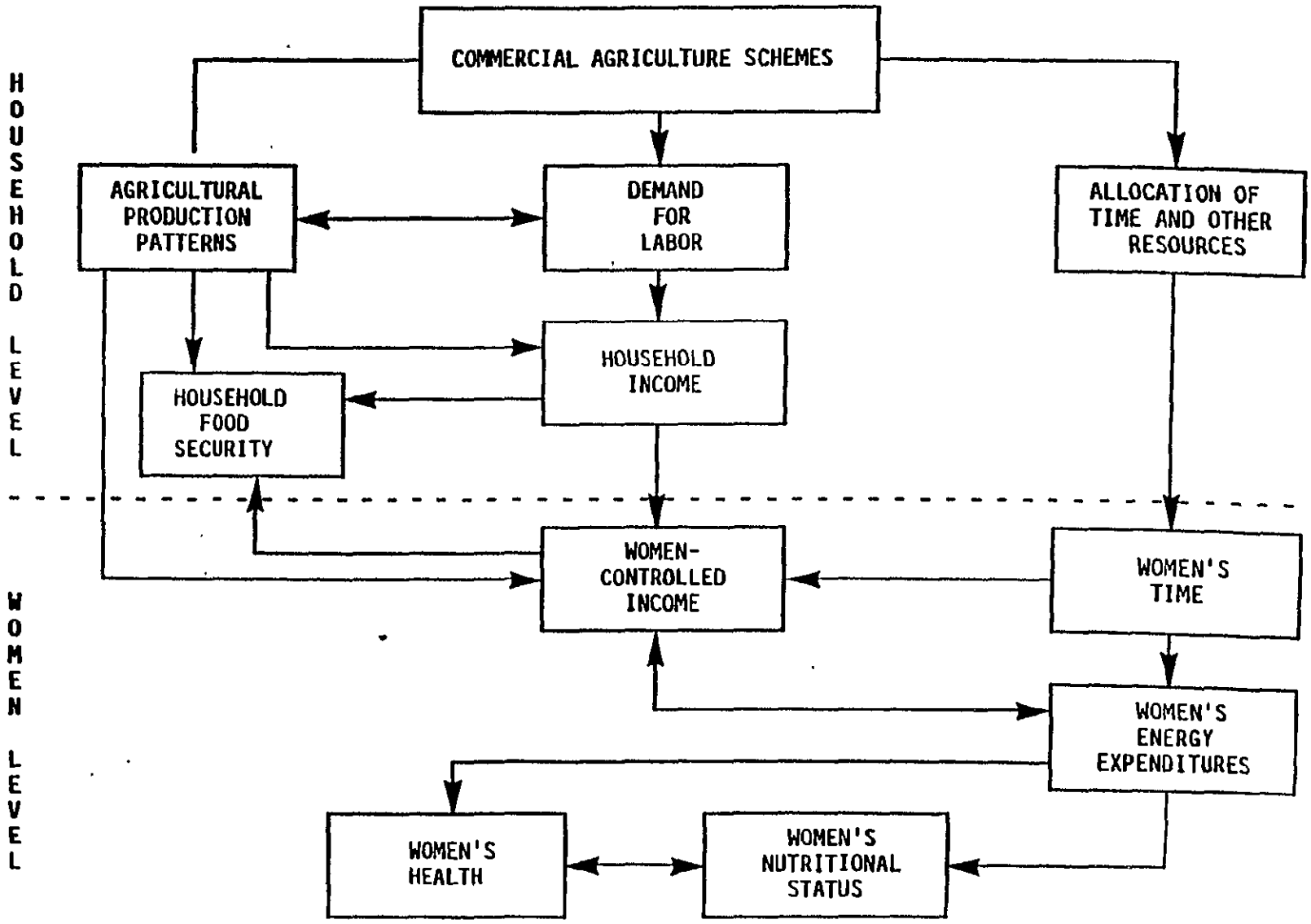
CONCEPTUAL FRAMEWORK AND RESEARCH DESIGN

Figure 1 provides a simplified conceptual model of pathways through which cash crop production can potentially influence households and ultimately the health and nutritional status of women. Much of the early work evaluating the impact of commercial agriculture focused on household-level outcomes. There was often the implicit assumption that if the household benefitted from commercialization through increased income, then each individual household member also shared in this benefit. This assumption is now questioned.

Until recently gender issues have rarely been included in the analysis of cash cropping schemes. However, even where gender issues have been included as part of an assessment of commercial agriculture schemes, much of the analysis has been limited to the impact of cash cropping on women's income and/or on women as the primary caretakers of children. Virtually no information exists on the direct effect of the commercialization of agriculture on women's health and nutritional status. The primary purpose of this paper is to assess the effects of a commercial sugarcane scheme on the well-being of women.

There are a complex set of linkages between households and women level impacts. The schema outlined in Figure 1 assumes that the entry of a household into commercial agriculture can affect women--either positively or negatively--through its impact on woman-controlled income, woman's time, and/or energy expenditures. These factors can ultimately influence a woman's health and nutritional status.

FIGURE 1
COMMERCIALIZATION OF AGRICULTURE
POTENTIAL PATHWAYS THROUGH WHICH WOMEN'S
HEALTH AND NUTRITIONAL STATUS MAY BE INFLUENCED



Chapter I.4

A representative sample of agricultural and nonagricultural households was drawn from the community served by South Nyanza Sugar Company (Sony) in Southwestern Kenya. The Sony outgrowers' program is typical of smallholder schemes throughout Kenya. Farmers are under contract to the factory; the factory agrees to buy all the sugarcane produced by the contract farmers at the price prevailing at time of harvest.

Initial survey work began in June 1984 and ended in March 1985. A follow-up study was conducted from December 1985 to October 1987. Households included in both the 1984/1985 and 1985/1987 studies are referred to as the cohort sample. All women in each of the sample households were included in the study.

EMPIRICAL RESULTS: COMMERCIAL AGRICULTURE AND CONTROL OF INCOME

Proponents of a strategy advocating the commercialization of agriculture have assumed that incomes of farmers would increase as they switched all or part of their land into cash crop production. While higher income is only one of a series of outcomes, it clearly is an important one. The incomes of farmers who participated in the small holder sugarcane scheme were significantly higher than non-cane producers. A large part of this increment in income was due to sugarcane production.

What effect has this increment in income in sugar producing households had on women-controlled income? There is no significant difference in the proportion of income controlled by women in sugarcane versus non-sugarcane producing households. Although, since

the absolute amount of income is higher in sugarcane producing households, the absolute amount of income controlled by women in these households is also higher when compared on non-sugarcane producers..

What are the implications, if any, of women-controlled income? One criticism of cash cropping schemes is that even if household income increases, there could be a deterioration in household-level food security because of shifting control of incomes from women to men. This issue is examined in the household consumption function presented in Table 1. As expected, total household income has a positive and significant effect on household caloric consumption. However, above and beyond the pure income effect, the percent of income that is female controlled also has a positive effect. While this women's income effect has a positive impact on household food security, the net effect in actuality is small. A difference in female-controlled income in the range of 3 to 5 percent would imply a beneficial effect of 60 to 100 calories; divided among an average household size of 10, this per capita effect on calorie intake is negligible.

COMMERCIAL AGRICULTURE, AGRICULTURE PRODUCTION, AND WOMEN'S LABOR USE

Farming in South Nyanza is dominated by smallholder agriculture, with the households providing most of the agriculture labor. Maize is the main staple with all crops grown under rain fed conditions. There is bimodal pattern of rainfall with a long rains and short rains cropping pattern.

Table 1—Household caloric intake

Variable	B	T-Statistic
Income (annual)	1.72	5.63
Income squared	-1.27-04	-4.14
Percent female income	20.31	3.32
Head of household schooling (in years)	-139.00	-2.98
Adult equivalents	2,230	47.86
R^2 = 0.62		
F = 273.88		
Sign F = 0.0000		

Table 2 presents a profile of the long and short rains cropping patterns for the different types of agricultural households. Most notable is the significantly smaller percentage of total farm area devoted to all crops by nonsugarcane farmers compared to sugar farmers. This is true for both time periods presented. Table 3 data examine the implications of these different land use patterns for both household and female labor. There are no differences between the new entrants, sugar- and nonsugar-producing households in the total allocation of male, female and child labor for the major food crops--local maize, hybrid maize, and sorghum.

The allocation of household labor is very task specific (Table 4); this is true for each of the categories of households.

Men spend a disproportionate part of their labor on tasks, such as land preparation and hoeing and smoothing, whereas women tend to be involved in planting, weeding, and harvesting. This task specificity of male and female labor is true regardless of whether it is a male- or female-controlled plot of land.

The amount of female provided labor into sugarcane production is negligible. The amount of time going into total agriculture is very similar across the three types of agricultural households (Table 5). For women from any type of agricultural household, the major portion of time in any day is devoted to domestic activities, including collecting water and fuel. It is, therefore, not surprising that the time spent away from home is greatest for women from agricultural households and least for women from the Sony Sugar employee households. Sony women live on the sugar estate where piped-in water

Table 2—Characteristics of farming patterns for agricultural households[1]

	1985 Long Rains			1986 Short Rains		
	New Entrants	Sugar	Nonsugar	New Entrants	Sugar	Nonsugar
Farm size (ha)	4.8	5.1	3.4	4.8	5.1	3.3
Mean number of plots	6.9	7.4	6.0	6.9	7.1	5.8
Mean number of crops	8.3	8.6	7.3	8.1	8.2	6.8
% of farm area devoted to all crops	49.1	55.2	35.6	53.5	57.6	42.7
% of farm area devoted to food crops	26.9	25.6	31.8	30.0	29.4	42.1
Mean area (ha)/capita devoted to food crops	0.13	0.12	0.11	0.15	0.14	0.14

	1986 Long Rains		
	New Entrants	Long Rains Sugar	Nonsugar
Farm size (ha)	5.0	5.1	3.4
Mean number of plots	7.0	7.0	5.9
Mean number of crops	8.4	8.6	7.2
% of farm area devoted to all crops	55.6	58.2	44.4
% of farm area devoted to food crops	31.4	29.6	40.3
Mean area (ha)/capita devoted to food crops	0.17	0.14	0.14

[1] New entrants are farmers just entering the sugar cane scene; sugar farmers are households who have received payment for at least one sugar cane crop.

Table 3—Allocation of labor within a household for major food crops during the long rains, 1986[1]

Hybrid maize	New Entrants Household Labor[a]			Sugar Farmers Household Labor			Nonsugar Farmers Household Labor		
	Men	Women	Children	Men	Women	Children	Men	Women	Children
Local maize	43	49	6	48	53	4	44	54	4
Hybrid maize	55	49	4	33	45	1	62	54	5
Sorghum	31	48	10	41	60	1	34	76	3

[a] All labor in days/hectare.

[1] New entrants are farmers just entering the sugar cane scene; sugar farmers are households who have received payment for at least one sugar cane crop.

Table 4—Household labor, by task, men, women, and children (Person/Days/Hectare)

Task	Long Rains				Short Rains			
	Men	Women	Children	All	Men	Women	Children	All
Land clearing	7.6	1.5	0.2	9.3	7.9	3.2	0.5	11.6
Hoeing and smoothing	10.8	2.6	0.8	14.3	11.7	4.4	1.1	17.2
Fertilizer application	6.4	11.6	0.1	18.1	2.5	3.6	1.8	7.9
Planting	6.2	7.0	0.4	13.6	5.0	7.4	1.0	13.4
Weeding	18.3	26.7	2.3	47.3	14.9	33.7	3.4	52.0
Harvesting	3.6	15.1	0.8	19.5	2.4	10.0	1.1	13.5
Processing	0.0	6.3	0.1	6.4	0.0	3.6	0.0	3.6
Marketing	0.2	8.2	0.2	8.5	0.6	6.3	0.1	7.0
Total days	53.1	79.0	4.9	137.0	45.0	72.2	9.0	126.2
Percent of total days	39.0	58.0	3.0	100.0	36.0	57.0	7.0	100.0

Table 5—Women's time allocation by activity, all-round average[a]

Activity	Mean							
	New Entrants	Sugar Farmers	Nonsugar Farmers	Merchants[1]	Sony Employees[2]	Landless	Relocated[3]	All
Domestic act	7.49	7.46	7.48	6.48	7.93	7.41	7.21	7.41
Time on child care	0.81	0.73	0.73	0.56	1.90	0.66	0.76	1.02
Animal husbandry	0.10	0.15	0.09	0.04	0.07	0.01	0.08	0.10
Agriculture, except sugarcane	2.21	2.36	2.29	0.73	0.43	1.03	2.13	2.08
Manufacturing	0.22	0.12	0.12	0.89	1.12	0.16	0.21	0.22
Nonhousehold activities	0.93	1.28	1.19	0.69	1.05	0.78	0.91	1.07
Agriculture - sugarcane	0.14	0.08	0.03	0.07	0.04	0.09	0.04	0.07
Employment	0.11	0.11	0.16	2.99	0.04	1.15	0.21	0.30
Relaxing	2.21	1.90	2.35	1.14	2.58	2.14	2.23	2.16
Sleep	9.29	9.26	9.25	9.50	9.41	9.63	9.65	9.35
Total time, excluding leisure	20.50	20.80	20.60	21.40	20.10	20.30	20.40	20.60
Total energy expenditure on a typical day	2,545	2,587	2,545	2,304	2,574	2,379	2,538	2,535
Time away from home	6.10	6.50	6.40	4.60	2.10	4.90	6.20	6.10

[a] Units equal hours per day.

[b] Units equal kilocalories.

[1] New entrants are farmers just entering the sugar cane scene; sugar farmers are households who have received payment for at least one sugar cane crop.

[2] Households employed on the South Ryantz (SORY) Sugar Estate. Households who major source of income is from a self-owned business.

[3] Households who were relocated as a result of the creation of the sugar business.

and stoves are available in the factory-provided housing. The time going into household production is much less for Sony women than for agricultural women.

The total amount of time accounted for each day is similar for women from the different categories of households. However, because the energy intensity of activities varies, the total energy expenditure per woman per day is different despite the similarity in the total hours spent each day in nonleisure activities. The implications of these different activity patterns for health and nutritional status of women will be examined in the next section.

COMMERCIALIZATION OF AGRICULTURE AND THE EFFECT ON WOMEN'S HEALTH AND NUTRITIONAL STATUS

The Sony sugarcane scheme is one form of development assistance that was targeted to the South Nyanza district with the expectation that the economic growth generated by the outgrowers' program would result in improved health and nutritional status for the population as a whole, including women. Table 6 data show the prevalence of total illness and nutritional status (as measured by body mass index) for women from different types of households. There is no difference, on average, in either of these indicators, despite dramatic differences in household income across the different categories of households. These findings are reinforced by the results shown in Tables 6A and 6B, which indicate that there are no significant differences in either women's prevalence of illness or body mass index stratified by household income per capita.

There are two major ways that increased income could affect health and nutritional status--either by decreasing morbidity or through improving caloric intake, which in turn would increase a woman's body mass index. Data in Table 7 indicate that neither total household income nor total expenditures (food plus nonfood) are significant determinants of morbidity patterns in women. The increased income associated with sugarcane production is used primarily for school fees and improved housing. While these categories of expenditures are important, they do not appear to be associated with a health benefit, at least in the short term.

Household income (Table 7) also does not have a positive impact on a woman's body mass index. Even more surprising is the finding that as the percent of a woman's income increases, her BMI decreases. This is very counterintuitive until one examines the linkages between household income, woman's income, and nutritional status.

Data indicate that energy expenditure patterns vary for women from different types of households. For many of the women in agricultural households, energy expenditures increase with their increasing income. Therefore, increased caloric intake translates into increased activity and not an increase in BMI.

HOUSEHOLD STRUCTURE AND WOMEN'S AND CHILDREN'S NUTRITIONAL STATUS

The discussion thus far has focused on income generating activities - primarily sugarcane and food crop production - as a way of classifying households. However, categorizing households simply by major economic activity may obscure some important differences in

Table 6—Mean body mass index and total prevalence of illness for women, by household type

Household Classification	$\bar{X}$ BMI[a]	Total Percent Time Ill[a]
New entrants	22.4[b]	20.3[b]
Sugar farmers	22.2	20.2
Nonsugar farmers	22.2	19.3
Merchants[1]	22.7	16.4
Sony[2]	24.8	25.8
Landless	21.8	20.8
Relocated[3]	23.1	15.5

[a] Based on average of all rounds.

[b] No two groups significantly different.

[1] New entrants are farmers just entering the sugar cane scene; sugar farmers are households who have received payment for at least one sugar cane crop.

[2] Households employed on the South Ryantz (SORY) Sugar Estate. Households who major source of income is from a self-owned business.

[3] Households who were relocated as a result of the creation of the sugar business.

Table 6A—Women's prevalence of total illness, by income/capita quartiles

	Income/Quartile Per Capita			
	1	2	3	4
Total percent time ill	21.4 (170)	25.6 (162)	26.1 (140)	22.8 (159)

Note: Number in parentheses equals number of women.

[a] No significant difference among groups.

Table 6B—Women's body mass index, by terciles of income/capita

	Income/Capita		
	1	2	3
BMI	22.73 (182)	22.61 (202)	21.99 (215)

Table 7 --Selected coefficients for morbidity and nutritional status models for women

Women's Total Percent Time Ill				Women's Body Mass Index	
Income Model		Expenditure Model			
Annual income	-2.84-04 (-0.19)	Annual total expenditures	-1.0 (-0.55)	Annual income	-1.18-05 (-0.76)
Annual income squared	4.56-08 (0.31)	Annual expenditures squared	2.69-09 (0.30)	Annual income squared	2.97-11 (-2.2)
Health expenditure/ capita	0.02 (1.34)	Health expenditure/ capita	-1.52-03 (-0.43)	Percent female income	-1.47 (-2.58)
				Percent sick	-0.015 (-2.23)
				Household size	-0.01 (-0.35)
R^2 =	0.04	R^2 =	0.044	R^2 =	0.03
Degrees of freedom =	1,537	Degrees of freedom =	1,537	Degrees of freedom =	462
F =	3.99	F =	4.14	F =	2.7
Significance F =	0.0000	Significance F =	0.0000	Significance F =	0.02

household structure which influence food security and nutritional status.

Table 8 stratifies some indicators of children's and women's nutritional and health status by quartiles of household income per capita. None of the differences reported are statistically significant with the exception of percent household caloric adequacy which increases with increasing income. Some other information is worth noting. For children, there is not a significant difference across income groups in any of the nutritional status measures; there is also no significant difference in the mean BMI for women across income quartiles. Women's energy expenditure increases within the first three income groups before finally declining in the highest income quartile.

These results are examined in a different way by stratifying the data not only by income groups but by gender of head of household (Table 9). In analyzing the results this way, differences emerge. The average Z-score for weight for age in the lowest income group is significantly better for preschoolers from de facto female headed households compared to children from male headed households. Similar results are shown for height for age comparing de facto female headed to male headed households. Curiously, these differences between male and certain types of female headed households do not appear for households in the highest income group.

For the lowest income quartile there is a tendency for women from both de jure and de facto female headed households to have a higher average BMI.

Table 8--Selected preschooler characteristics by household income per capita quartile

	Household Income Per Capita Quartile			
	1	2	3	4
Weight-for-age Z-score	-1.08	-1.08	-1.01	-1.04
Percent less than -2.0	21.9	19.7	15.7	17.3
Height-for-age Z-score	-1.68	-1.72	-1.65	-1.50
Percent less than -2.0	41.4	40.4	38.5	35.7
Weight-for-height Z-score	-.02	-.01	.01	-.14
Percent less than -1.0	2.6	2.0	2.5	2.0
Percent child caloric adequacy	51.87	55.66	61.36	60.23
Percent less than 80 percent	87.8	84.8	79.2	81.6
Child/household caloric adequacy	.59	.62	.62	.61
Percent total time ill	30.24	28.63	29.24	30.17
Percent time ill with diarrhea	3.20	4.75	4.11	3.61
Percent household caloric adequacy	91.75	92.87	103.21	102.48
Mother's time away (hours)	6.11	6.20	6.14	5.49
Mother's child care (hours)	.63	.65	.69	.64
Mother's Body Mass Index	22.44	22.34	22.17	22.21
Mother's energy expenditure	2,567.94	2,573.15	2,589.33	2,532.29
N	311	305	287	266

Source: International Food Policy Research Institute, South Nyanza Survey 1985/87.

Note: The variables above were computed for all available cases; hence, the N slightly varies from variable to variable.

Table 9--Selected preschooler characteristics by gender of head of household, lowest and highest quartiles of household income per capita (based on round-by-round preschooler data)

	Lowest Quartile			Highest Quartile			All Quartiles		
	Male	Female		Male	Female		Male	Female	
		De jure	De facto		De jure	De facto		De jure	De facto
Weight-for-age Z-score	-1.15[a]	-.97	-.60[a]	-1.06	-.87	-1.01	-1.09	-.90	-.90
Percent less than -2.0	23.4	19.2	12.5	17.7	6.3	23.1	19.3	15.6	17.3
Height-for-age Z-score	-1.76[a]	-1.65	-.98[a]	-1.52	-1.36	-1.38	-1.69	-1.48	-1.34
Percent less than -2.0	43.1	40.8	26.1	37.3	25.0	18.2	40.6	34.1	29.6
Weight-for-height Z-score	-.07	.20	-.08	-.14	-.05	-.20	-.05	.08	-.12
Percent less than -1.0	2.2	4.1	4.3	1.8	0.0	9.1	1.9	3.0	5.6
Percent child caloric adequacy	52.86	44.26[b]	58.73[b]	61.48	51.22	49.34	57.31	54.28	59.18
Percent less than 80 percent	86.2	98.0	81.8	80.2	87.5	100.0	83.1	84.0	87.3
Percent total time ill	31.33	26.93	26.41	30.35	32.51	23.99	29.77	28.62	28.54
Percent time ill with diarrhea	3.23	3.05	3.27	3.58	5.47	1.79	3.88	4.11	4.13
Number of meals	2.96	2.98	2.73	3.21	2.82	3.02	3.07	3.08	2.95
Child:adult ratio	1.69	2.04	1.79	1.65	1.61	1.60	1.59	1.80	1.86
Percent household caloric adequacy	91.33	98.01[b]	82.70[b]	102.86	100.87	97.58	97.47	98.33	95.84
Percent less than 80 percent	28.4	30.4	71.4	16.7	25.0	0.0	24.7	22.2	22.4
Mother's schooling (years)	3.58	4.13	3.50	4.85	5.46	6.00	3.94	4.34	3.38
Mother's Body Mass Index	22.38	22.56	22.77	22.00	24.85	23.35	22.21	22.74	22.69
N	235	52	24	237	16	13	959	135	75

Source: International Food Policy Research Institute, South Nyanza Survey 1985/87.

Note: The variables above were calculated for all available cases; hence, the N varies slightly from variable to variable.

[a] De facto female-headed households significantly different from male-headed households at .05 level of significance.

[b] De facto female-headed households significantly different from de jure female-headed households at .05 level of significance.

Table 10 presents some of the child level data in a different way. Not only is the average Z-score for weight for age presented, but the proportion of children falling below a -2.0 Z score (a measure of moderate and severe malnutrition) is also shown. The results for the lowest income quartile are more dramatic; significantly fewer preschoolers from de facto female headed households fall below the cut-off when compared to preschoolers from male headed households.

These results are corroborated by the probit analysis presented in Table 11. Preschoolers from de facto female headed households are less likely to be moderately and severely malnourished. In addition, increases in household income also are associated with a lower probability of being moderately and severely malnourished. The positive influence of de facto female headed households on child nutrition is found only in the lowest income group; this effect disappears for the middle and upper income group. The interaction of additional income and de facto headship in the lowest income tercile works to the advantage of preschooler nutritional status.

A similar analysis of the effect of headship on women's nutritional status is shown in Table 12. Women's BMI from all female headed households combined is significantly higher than that of women in male headed households.

There are differences in activity patterns across the three types of households. In male-headed and de jure female headed, as household income increases, the time devoted to work (non-leisure) decreases. However the same is not true for women from de facto female headed households. As household income increase, time devoted to work

Table 10--Nutritional status of preschoolers from Kenya

	Male	All Female	De jure	De facto
Percent with Z-scores less than -2				
Weight-for-age	18.6	15.5	16.0	14.6
WAZ less than -2.0				
Bottom tercile	19.9	15.9	19.7	9.8
Middle tercile	20.6	13.2	7.7	20.7
Top tercile	15.6	17.1	17.5	15.8

Table 11--Probit analysis[a] of effect of household income and gender of head of household on preschooler nutritional status (weight-for-age), Kenya

	Lowest Income Tercile Per Capita	Middle Income Tercile Per Capita	Highest Income Tercile Per Capita
Income per capita	-.62 -03 (-2.35)[b]	-.29 -03 (-1.20)	-.17 (-1.1)
De facto household	-.81 (-2.19)	-.21 -01 (-.06)	-.39 (-.70)
De jure household	-.58 -01 (-.27)	-.93 (-1.72)	.32 (1.3)
Gender (1 = boy)	.14 (1.0)	.17 (1.0)	.26 -01 (.16)

[a] Full probit model included weight-for-age Z-score less than -2 (1 = yes) as f (household survey percent children in household, percent men in household, de facto female head).

[b] t-statistic in parentheses.

Table 12--Selected women indicators, by gender of head of household, by household income/capita tercile (1=lowest tercile)

Indicator	Male	Female	All Female		All
			De jure	De facto	
Body Mass Index					
1	22.41	22.84	22.45	23.44	22.49
2	22.12	22.40	22.70	21.67	22.16
3	22.13	22.89	22.70	23.68	22.25
All terciles	22.21[a]	22.72[a]	22.62	22.94	22.30
N	819	174	122	52	993
Total energy expenditure/day					
1	2,562.12	2,561.94	2,554.48	2,573.59	2,562.08
2	2,552.82	2,573.57	2,556.90	2,623.61	2,556.49
3	2,498.19	2,498.96	2,459.88	2,676.59	2,498.33
All terciles	2,538.02	2,546.98	2,523.31	2,606.35	2,539.73
N	879	207	148	59	1,086
Percent total time ill					
1	18.82[b]	21.62	25.28[b]	17.54	19.44
2	23.81[b]	18.55	11.58[b]	29.20	23.01
3	23.27	23.65	21.95	29.98	23.33
All terciles	21.96	21.38	20.43	22.97	21.85
N	786	176	110	66	962
Nonleisure time (hours/day)					
1	10.41	10.61[b]	10.84[b]	10.23	10.45
2	10.49	10.44	9.99[c]	11.80[c]	10.48
3	10.05	9.34[b]	9.00[b]	10.96	9.93
All terciles	10.32	10.19	9.95	10.81	10.30
N	947	219	159	60	1,166
Percent share of income					
1	29.93[b]	38.62	42.81	34.75	31.64
2	27.72	34.86	37.63	31.12	28.79
3	22.12[a,b,c]	45.78[a]	60.14[c]	28.22[c]	24.23
All terciles	26.68[a,b]	38.56[a]	44.02[c]	32.47	28.44
N	644	112	59	53	756

Source: IFPRI South Nyanza Survey 1985/87.

[a] The difference between male- versus female-headed household within tercile group is significant at the 0.05 level.

[b] The difference across terciles within each gender of head of household category is significant at the 0.05 level.

[c] The difference from among male-, de jure female-, and de facto female-headed household within each tercile group is significant at the 0.05 level.

increases. Women from de facto female headed households in the highest income tercile have more hours devoted to work, on average, than women in the lowest income group. In the de facto female headed households, a large proportion of the incremental household income comes from women's income generating activities. In many cases these income generating activities are energy intensive.

COMMENTS AND CONCLUSIONS

This chapter explores the relationships between the commercialization of agriculture, household-level effects, and their impact on women. Sugarcane cultivation in this area of Southwestern Kenya is associated with significant increases in household income. The increased household income associated with smallholder sugarcane cultivation has a significant effect on household caloric intake. In addition, the proportion of female-controlled income has a beneficial effect on household food security in addition to the household income effect. Sugarcane cultivation has not jeopardized household food security.

However, there is a limited impact of the increased household income on women's health or nutrition. Increases in income associated with sugarcane cultivation are spent on categories of nonfood expenditures, which do not--at least in the short term--result in decreases in illness in women.

Similarly, increases in household income and women's income do not improve a woman's nutritional status. Improved caloric intake as a result of increases in income are used by many women to increase the

energy intensity of activities rather than to improve a woman's nutritional status.

More diversity in the nutritional status outcomes of women and children emerge when the same data are examined in the context of household income and household structure. The difference that headship has on children's versus women's nutritional status is a theme running through some of the other chapters in this volume. Women in de facto female headed households appear to be acting as "shock absorbers" for children's nutrition. At low levels of income, women in de facto female headed households are pursuing investment strategies that appear to protect child nutritional status. However, women's nutritional status is not preferentially affected by presence in a de facto female headed households.

The results from Kenya are consistent with a number of other case studies in this volume. First, dichotomizing households into male and female headed obscures some of the differences across different categories of female headed households. Female headed households are a much more heterogeneous group than once thought.

The presence in de facto female headed households has more positive effects on preschooler nutritional status than presence in de jure female headed household. This may be , in part, due to the fact that the head of a de facto female headed household is typically the mother of the study preschooler. The same is not true for de jure female headed households.

De facto female headship appears to act more to the advantage of preschooler than to the advantage of women. Data presented here

suggest that one key to improving female nutritional status is by decreasing the energy intensity of activities. Given that the major portion of the women's day in rural Kenya is spent on home production activities one way to achieve this is to relieve the time burden of these activities by developing labor saving methods for achieving the same end. Clearly this has already happened to women in households employed by the Sony Sugar Factory; the existence of piped in water has decreased the amount of time devoted to water collection to zero time. Thus in the longer term policy makers could anticipate that improving rural infrastructure would produce a whole series of benefits including potentially improvement in the nutritional status of women. However, in the shorter term, other innovative approaches need to be developed that lessen the time burden of women. In addition, any income generating development policies that add to women's work load will aggravate this situation unless simultaneously substitutes for women's time into home production activities can be found.

Chapter I.26

NOTES

1. The terms "cash crops" and "export crops" are often used synonymously. This creates confusion. A cash crop, as used in this paper, refers to a crop that is produced for sale. An export crop is a cash crop that is exported from the country.

2. The pros and cons of the cash crop debate are summarized in Joachim von Braun and Eileen Kennedy, Commercialization of Subsistence Agriculture: Income and Nutritional Effects in Developing Countries, Working Papers on Commercialization of Agriculture and Nutrition No. (Washington, D.C.: International Food Policy Research Institute, April 1986).

3. An example of this is found in Kathryn Dewey, "The Impact of Agricultural Development on Child Nutrition in Tabasco, Mexico," Medical Anthropology 2 (1980): 21.

4. For a detailed discussion of the rationale behind the study, including survey methodology, see Eileen Kennedy and Bruce Cogill, Income and Nutritional Effects of the Commercialization of Agriculture in Southwestern Kenya, Research Report 63 (Washington D.C.: International Food Policy Research Institute, November 1987).

5. Larry Lev, The Effect of Cash Cropping on Food Consumption Adequacy among the Men of Northern Tanzania, Working Paper No. 21 (East Lansing, MI: Michigan State University, 1981).

6. Jane Guyer, Household Budget and Women's Incomes, African Studies Center, Working Paper No. 28 (Boston: Boston University, 1980).

7. Kennedy and Cogill, Income and Nutritional Effects of the Commercialization of Agriculture.

8. These classifications are based on Government of Kenya, Central Bureau of Statistics definitions. *De facto* female-headed households are ones in which the male head of household is away more than he is home.

9. Smallholder is defined by Government of Kenya as operating less than 20 hectares of land.

10. Kennedy and Cogill, Income and Nutritional Effects of the Commercialization of Agriculture.

Chapter II.1

THE COMMERCIALIZATION OF AGRICULTURE IN THE PHILIPPINES: THE DETERMINANTS AND IMPACTS OF IMPROVED WOMEN'S NUTRITION IN A LABOR-SURPLUS ENVIRONMENT

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1. INTRODUCTION

This chapter addresses the concerns about the impact of the commercialization of agriculture on women's nutrition status in the Mindanao island of the Philippines. The commercialization of agriculture, and in particular export cropping, has often been blamed as a cause of poor nutrition. Critics contend that if the resources that were used to produce for the local economy had been used instead to produce food for the local economy, then the problem of malnutrition in many countries could be significantly reduced ,or even eliminated (Dewey 1979, Fleuret and Fleuret 1980).

However, research conducted in the late 1980s (Kennedy and Cogill 1987; von Braun, Hotchkiss, and Immink 1989, Bouis and Haddad 1990; von Braun, Puetz and Webb 1989, von Braun, de Haen, and Blanken 1991) showed that cash crop production is frequently associated with increased nominal income and that, depending on the marginal propensity to consume calories out of additional income, household food intake will rise. However, the findings relating additional income to preschooler growth and food consumption are inconsistent,

with the strength of the relationship varying widely across groups due to non-income factors (von Braun and Kennedy 1986).

The cash-cropping literature has not paid as much attention to women's nutrition status as it has to preschooler nutrition status. When attention has been paid to female nutrition status it has usually been as a means to an end (improved preschooler nutrition status) and not as an end in itself. But women's nutrition status can be strongly affected by commercialization because cash cropping can alter the structure of the intrahousehold allocative relationship by affecting the value of an individual's time, maternal beliefs and practices, and the availability and quality of substitutes for women's time.

2. COMMERCIALIZATION OF AGRICULTURE IN BUKIDNON, MINDANAO

The commercializing area is situated in the southern half of Bukidnon province at the center of the southernmost large Philippine island of Mindanao. The island is often perceived to be the last frontier area in the Philippines, but since the 1960s there is ample evidence of the frontier filling up as land constraints become binding. In-migration has rapidly declined, the man-to-land ratio has increased, population mobility within the island is directed toward urban areas and the male-female ratios on the island have become more evenly balanced--all symptoms of a maturing frontier (Costello 1984) and a labor surplus environment.

One component of this structural transformation has been the development of cash crops in Mindanao. The absence of the strong winds that affect the rest of the Philippines allows year-round

cultivation of fruit-bearing trees in Mindanao; this coupled with the relatively low population density and the often ambiguous legal claims to land rights in this region, which is far from the political and administrative center of Manila, has partially facilitated the establishment of large-scale multinational export ventures in Mindanao.[1]

Changes in the international economic environment also contributed to the development of plantation agriculture. The nationalization of the palm oil plantations in Malaysia caused Guthrie Overseas Holding, Ltd. to set up palm oil plantations in eastern Mindanao (Agusan), the high cost of labor in Hawaii led Del Monte and Castle and Cooke, Inc. to relocate and expand their plantations in Bukidnon and South Cotabato provinces, and the opening of the Japanese banana market encouraged the development of banana plantations on the southern part of the island in and near Davao (Lim 1987). In addition, rubber, coffee, and cacao production, partly on a smallholder basis, increased rapidly during the late 1970s and early 1980s.

Most of the study area is crisscrossed by a network of unimproved feeder roads, giving most farms relatively easy access to markets for their output. Although smallholder farms are larger than average for the Philippines (and in fact 20 percent larger than for the Region), population pressure is already apparent in the cultivation which is taking place on hilly slopes. By the mid-1970s smallholder agriculture was almost exclusively devoted to corn and some upland rice farming, except for small areas of irrigated rice production. Corn exports

flow north to Cagayan de Oro and thence to the heavy corn-eating areas of the Central Visayas.

The Bukidnon Sugar Company (BUSCO) began operations in 1977, established in response to the high world sugar prices of a few years before. When BUSCO first began operations, it depended primarily on cane production from a few large haciendas located near the mill. These haciendas apparently did not displace much corn production. They were established on lands held by wealthy families who either had not developed the land previously or were using the land for grazing cattle. Many of the hacienda owners (although not all) also had business interests in the mill. Cane production was sufficiently profitable that there was generally a high demand for contracts with the mill. Since large haciendas could not supply enough cane to meet the capacity of the mill (the mills' capacity was expanded around 1981), smallholder production became important. The average size of sugar farms fell over time as sugar expanded to a total of around 25,000 hectares during the survey period. Contracts for as little as one and two hectares were given out.

Concurrent with the expansion of the area planted to sugar and other commercial crops in Bukidnon, the area devoted to palay (unhulled rice) and corn diminished. Over the period 1976-1981 the area planted to sugar grew from 1,900 hectares to 16,200 hectares while the area planted to corn fell by 36 percent and the area planted to palay by 30 percent (Madigan 1983, 1985).

3. THE BUKIDNON DATA SET

The Bukidnon data set is a stratified (by crop and tenancy type) random sample of 448 rural households in the southern Philippine island of Mindanao. The data were collected in four evenly spaced survey rounds covering a 16 month period. The data set has been described in detail in Bouis and Haddad (1990). Income and total expenditure were tightly associated with calorie consumption from both a 24-hour recall and food availability recall, although the true magnitude of the response is perhaps less than is generally considered conventional (Bouis and Haddad 1992). Mothers education was strongly and positively associated with household food expenditure, preschooler calorie intake, and preschooler height-for-age. Seasonality was a minor factor for preschooler Z-score determination, but was more important in determining household calorie intakes.

4. WOMEN'S NUTRITION STATUS IN BUKIDNON

Table I shows that female BMI is higher than male BMI (19.33 vs. 18.74). Once pregnant and lactating women are removed from the sample, the female:male difference narrows considerably (18.97 vs. 18.74). For households in the lowest per capita total expenditure tercile, female BMI is actually lower than male BMI. The mean BMI of adult females increases slightly (but not statistically significantly) by per capita household total expenditure tercile, (per capita total expenditure, increases by a factor of five from the bottom tercile to the top). Disaggregating women by physiological status, mean BMI is slightly more responsive to income in the non-pregnant/non-lactating, and

Table 1: Mean Body Mass Index (BMI) and percent BMI below 18.5 Kg/m^2, adult males and females, by physiological status and per capita total expenditure tercile, Philippines.

BMI measure	all males		all females		nonpregnant, nonlactating females		pregnant, lactating females	
mean BMI by per capita expenditure tercile:	mean	n	mean	n	mean	n	mean	n
low	18.55	765	18.78	823	18.18	615	20.56	208
medium	18.66	828	19.44	761	19.13	628	20.88	133
high	18.98	841	19.76	837	19.51	723	21.35	114
all	18.74	2434	19.33	2421	18.97	1966	20.85	455
percent BMI below 18.5 by per capita expenditure tercile:	percent	n below	percent	n below	percent	n below	percent below	n
low	43.01	329	48.00	395	57.89	356	18.75	39
medium	44.08	365	39.55	301	44.75	281	15.04	20
high	40.55	341	38.47	322	42.19	305	14.91	17
all	42.52	1035	42.05	1018	47.91	942	16.70	76

pregnant groups, but again these effects are under 5 percent in magnitude.

From the same table we can see that percent BMI below the 18.5 Kg/m^2 cutoff is more sensitive than mean BMI to per capita expenditure, especially for non-pregnant, non-lactating women. Only 16.7 percent of pregnant and lactating women have a BMI below 18.5, while 47.91 percentof non-pregnant/non-lactating women are below the cutoff. For this latter group, the reduction in percent BMI below 18.5 across per capita expenditure terciles is from 58% to 42%, while for men the drop is only 43 to 41%. Clearly, higher per capita total expenditure is associated with increases in women's energy intake which are more than large enough to compensate for simultaneous changes in women's energy expenditures.

5. HOW DOES COMMERCIALIZATION AFFECT THE *DETERMINANTS* OF WOMEN'S NUTRITION STATUS IN MINDANAO?

5.1 Previous Studies

The original study focussed on the determinants of preschooler anthropometric status, and apart from age, one of the most important determinants was the mix of crops grown by the households. This mix of crops influenced the time allocation pattern of the mother, which then was hypothesized to affected the child through maternal nutrition and time spent in breast-feeding in the post-birth period. Preschoolers of sugar-producing households got off to a better head start than their corn counterparts, but fell back to the level of the

corn preschoolers by way of higher morbidity rates of the age of 2-3 years.

Sugarcane production resulted in a decrease in the demand for women's labor in own-farm agricultural production. This was due to the heavy tasks involved in sugarcane production. This outcome is very different from the Kenyan case study. In Kenya, labor is the binding constraint, and where sugarcane production took place on previously fallow land there was marginal increase in demand for women's labor in own-farm agricultural production, (Kennedy 1990). But in Mindanao, land is constrained and labor is surplus, hence hired labor could be brought in to undetake the sugar cane activities. Consequently, maize production in Bukidnon contributes about a third of total labor inputs, whereas for sugar, two-thirds of the labor for sugarcane production is hired.

The implications of these changes for female time allocation patterns are striking. All women, irrespective of household tenure-crop type, decrease time spent in own-farm production and off-farm employment when they are either pregnant or breastfeeding; time spent in strenuous activities is reduced, time spent away from home is reduced, and energy expenditures are reduced. During pregnancy, time available for personal care and relaxation reaches a maximum. During breastfeeding, time available for personal care and relaxation is minimized, as time spent in childcare peaks (Bouis and Haddad 1990).

Due to greater responsibilities in own-farm production, maize household women are not able (or do not choose) to curtail their strenuous activity to as great an extent as sugar household women

during pregnancy and breastfeeding. During breastfeeding, sugar household women spend more time in childcare and more time at home than do maize household women. However, once infants have been completely weaned sugar household women, perhaps reflecting the relatively low opportunity cost of their time in own-farm production, increase their time *away from home* by two hours per day more than when they were pregnant. The corresponding increase for maize household women is only about one hour per day.

The increase in mothers' time away from home due to commercialization does not seem to raise the opportunity cost of adolescent females' time enough to cause them to be taken from school. In fact female adolescent nutrition status does not seem to suffer as a consequence of potentially having to substitute for mothers time away from home due to commercialization of agriculture (Bouis 1992).

5.2 Determinants of Female and Male BMI

Table 2 presents the models developed for adult females and males in the Bukidnon sample. Per capita total expenditure (instrumented with assets and characteristics of dwelling) is not a significantly associated with adult BMI. The number of days sick (instrumented with ???) was not signifcant either. In fact the model is disappointing in its ability to predict BMI. For example the descriptive analyses would lead us to expect the number of days worked by women in agricultural employement to have a negative effect on BMI (have to re-run with agdays instead of totdays). We do get a negative effect of total days worked on BMI for women, but it is not significanlty different from

Table 2: BMI Determinants: males over 14 years of age and non pregnant, non-lactating females greater than 14 years of age. Two stage least squares estimates

Variable	males		females		females	
	beta	t	beta	t	beta	t
LNTE*	0.5184	1.546	-0.4438	-0.314	-3.1614	-1.518
DSICK*	-3.8024	-1.573	-5.1658	-0.789	-18.4796	-1.605
AGEYR	0.3590	14.203	0.3736	1.972	0.3134	5.167
SQAGE	-0.0043	-11.946	-0.0058	-2.246	-0.0036	-4.324
NMEM	0.0568	1.043	0.3737	2.421	0.1873	0.951
NCH	-0.0588	-0.880	-0.4600	-2.156	-0.6476	-2.090
NFADLT	-0.0667	-0.841	0.2777	0.989	0.5857	2.055
PCTPSCH	-0.0045	-1.349	-0.0132	-1.475	-0.0203	-1.667
CULTARPC	0.2339	0.852	1.5124	1.251	2.7193	1.608
RD1	1.9609	1.676	0.7555	0.311	5.7745	1.419
RD3	0.1749	1.137	-0.2714	-0.391	-0.6863	-0.837
DED	0.4424	3.057	0.6013	0.926	1.1156	1.743
DTOTDAYS			-0.4147	-1.175		
Constant	11.4406	8.475	16.2919	2.595	28.2025	3.245
Adjusted R2	0.2305		0.0608		0.0283	
F-test	30.9277		3.4307		3.0710	
N	1200		489		855	

None of these variables were signifcant when allowed to vary by crop-tenancy group.

zero. When this variable is dropped the number of adult females in the household becomes significant and positive. We found this result in Ghana: the more adult women, the more sharing of tasks. Note that when we put in the total number of days dummy variable, number of adukt females no longer has an impact on BMI. This indicates that there are few economies of scale in energy expenditures from having more adult females in the household. However, the number of children in the household improves female BMI in both models, but not male BMI. This could indicate that children may substitute for adult female time.

6. HOW DOES COMMERCIALIZATION AFFECT THE *IMPACTS* OF WOMEN'S NUTRITION STATUS IN MINDANAO?

If commercialization improves female BMI, what are the benfits to the rest of the family members? If we believe that better nutrition status for women will lead to higher wage rates and a higher opportunity cost of women's time in domestic activities [2] how does this affect the food security of other household members?

6.1 Impact on intrahousehold food allocation

Table 3 reports regression results where the dependent variable, RARC, is preschooler calorie adequacy relative to household calorie adequacy. Regressions are run in each of the 5 total per capita expenditure quintiles in order to partially control for income without including it as an endogenous variable in the regression. The predicted wage rate variables of maels and females are significant in four out of the five expenditure quintiles, maintaining the same sign and similar magnitudes within each.

Table 3--Intrahousehold calorie distribution functions for preschoolers estimated for each total household expenditure quintile

Dependent variable (preschooler calorie adequacy/hh calorie adequacy) * 100

Independent Variables	Estimated Coefficient	T-Stat*	Variable Mean
Quintile One (lowest)			
Constant	223.4763	4.457	
Predicted wage, household head (pesos/day)	1.8195	3.138	21.17
Predicted wage, mother (pesos/day)	-4.2358	-2.882	19.16
Age of preschooler (months)	1.7987	3.520	41.25
Age of preschooler (months squared)	-.0220	-3.471	1843.51
Sex of preschooler (1-male, 0-female)	2.8973	1.694	0.46
Minutes spent in childcare yesterday	0.0020	0.315	97.19
Age of mother (years)	-.5327	-2.878	33.10
Mother's education (years)	1 2623	1.714	5.18
Mother's weight (kg)	-4.6502	-3.270	46.58
Mother's weight squared	0.0432	3.006	2214.74
No. of cases = 344 R square = 0.126	F = 4.801		
Quintile Two			
Constant	58.2074	1.175	
Predicted wage, household head (pesos/day)	4 1188	5.507	21.22
Predicted wage, mother (pesos/day)	-4.9096	-3.260	19.46
Age of preschooler (months)	2.1031	4.218	41.15
Age of preschooler (months squared)	-.0228	-3.658	1831.33
Sex of preschooler (1-male, 0-female)	5 7548	3.231	0.60
Minutes spent in childcare yesterday	0.0258	3.221	88.93
Age of mother (years)	-.5770	-3.433	30.67
Mother's education (years)	1 8994	2.751	5.21
Mother's weight (kg)	0.0526	0.035	44.97
Mother's weight squared	-.0048	-.313	2062 07
No. of Cases = 286 R Square = 0.260	F = 10.120		

(...continued)

Table 3 (continued)

Independent Variables	Estimated Coefficient	T-Stat*	Variable Mean
Quintile Three			
Constant	210.6496	3.930	
Predicted wage, hhead (pesos/day)	-.6715	-1.426	21.75
Predicted wage, mother (pesos/day)	-7.2023	-4.733	19.52
Age of preschooler (months)	0.2665	0.509	41.82
Age of preschooler (months squared)	- 0028	-.448	1875.77
Sex of preschooler (1-male, 0-female)	13.9189	8.849	0.58
Minutes spent in childcare yesterday	0.0301	3.741	72.13
Age of mother (years)	- 2765	-1.824	32.89
Mother's education (years)	3.3995	5.490	6 04
Mother's weight (kg)	0.2455	0.162	47.03
Mother's weight squared	- 0069	-.445	2255.48
No. of Cases = 266 R Square =0.335	F = 12.860		
Quintile Four			
Constant	118.8203	2.136	
Predicted wage, hhold head (pesos/day)	-.1927	-.459	22.33
Predicted wage, mother (pesos/day)	-2.1734	-1.141	20.01
Age of preschooler (months)	1.8257	3.052	41.44
Age of preschooler (months squared)	-.0219	-2.926	1880.28
Sex of preschooler (1-male, 0-female)	5.8843	2.693	0.58
Minutes spent in childcare yesterday	0.0216	1.942	69.21
Age of mother (years)	0.1589	0.916	31.83
Mother's education (years)	1.4784	1.753	7.34
Mother's weight (kg)	-2.1162	-1.287	46.26
Mother's weight squared	0 0248	1.474	2183.14
No. of Cases = 261 R Square = 0.125	F = 3.590		
Quintile Five (highest)			
Constant	23.1671	0.500	
Predicted wage, hhold head (pesos/day)	0.6223	2.462	26.26
Predicted wage, mother (pesos/day)	-2.9338	-2.152	20.28
Age of preschooler (months)	2.2529	5.150	39.56
Age of preschooler (months squared)	-.0251	-4.434	1734.58
Sex of preschooler (1-male, 0-female)	-2.0227	-1.015	0.60
Minutes spent in childcare yesterday	-.0097	-1.002	62.88
Age of mother (years)	0.4820	2.989	31.49
Mother's education (years)	1.6520	3.009	7.82
Mother's weight (kg)	1.0731	0.844	51.15
Mother's weight squared	-.0085	-.704	2671.38
No. of Cases = 258 R Square = 0.337	F = 12 610		

* T-critical, 0.05=1.96

source (Haddad 1987)

The predicted wage rate for men has a positive effect on RARC, while for women the effect is negative. This result may seem counter-intuitive but there are several reasons that may explain why rising opportunity cost of women's, (but not men's) time could have a negative impact on preschooler calorie adequacy relative to the rest of the household (as distinct from the preschooler's absolute calorie intake). The three most plausible, not necessarily mutually exclusive, explanations relate to the mother's role as food controller and preparer.

First, for women, a higher opportunity cost of time may be associated with a higher calorie requirement and a move to a higher calorie intake-requierment equilibrium. Men's energy requirements are similar whether or not they are wage earners; however, mother's energy expenditure may rise dramatically upon entering the work force (Haddad 1987). Second, concomitant with a rise in the woman's opportunity cost of time, there will be a greater reliance by the woman on more expensive value-added foods, which will probably be consumed firstly by the adults in the household. Third, as the mother's opportunity cost of time increases, there will be a greater reliance on individuals whose opportunity cost of time is not as high as that of the mother, i.e., her older children or her parents. These maternal substitutes may not have the same propensity as the mother to spend time with the child and provide it with a diet sufficient in nutrient quality and quantity.

6.2 Evidence on intergenerational transmission of nutrition status

Evidence on intergenerational effects is provided by Bouis' work (1992) on Bukidnon data from adolescent girls. While the higher nutrient intakes and the head-start afforded by lower energy expenditure during pregnancy in sugar households result in early preschooler height improvements, they do not seem to result in permanent improvements in height. Growth spurts for high-income adolescent girls and boys show a marked tendency to occur one to two years before the growth spurts of low-income adolescent girls and boys. Yet, high- and low-income children attain similar heights once they reach the ages of 17-19 years; high-income children approach these terminal heights faster. Better female nutrition status resulting from commercialization in a labor-surplus environment is initially transmitted to preschoolers, but the head-start they have is either negated by age 6 or later on during adolescent growth spurts.

7. CONCLUSIONS

Sugar cultuvation results in a reduction in the opportunity cost of women's leisure time. Women are more able to rest during pregnancy thereby improving weight gain of mother and baby during pregnancy. In terms of the consequences of improved women's nutrition status for the rest of the family, the picture is more complex.

Increased leisure time during pregnancy results in the birth of heavier babies. In addition, women are able to spend more time in breastfeeding. Once the child stops breastfeeding however, women spend more time in market activities. Again, this is consistent with a lower opportunity cost for women in sugar cultivation.

Children from sugar farm households do better than children from corn household, but only initially. Apparently, the extra income generated by the woman in the market place does not compensate for her extra calorie requirements and the drop in quality of child care time. One reason for this may be that the quality of the health environment in the sample area is not sufficient for the extra income earned to sustain good health.

Improving the quality of the health environment is one way to allow improved nutrition status of women to translate into better nutrition status for the rest of the family. Improvements in the health environment would reduce opportunity costs of women leaving the home in terms of child nutrition status foreone. This would seem especially important, given (i) that the preference for sending girls to school reduces the pool of mother time-substitutes, and (ii) that female education tends te reinforce the tendency to direct more household food intake towards children.

Chapter II.17

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Chapter II.20

Endnotes

1. Of course, the imposition of Martial Law in 1972 also reduced resistance to these changes.

2. While Haddad and Bouis 1991 could demonstrate this result for men, the sample of wage laborers was too small to test this hypothesis.

Chapter III.1

NUTRITIONAL STATUS, GENDER AND FEMALE-HEADED HOUSEHOLDS IN SOUTHERN MALAWI

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Since the 1970s, serious attention has finally been directed to the differential effects that development activities have on women as compared with men. "Women-in-development" has subsequently become a focus for both research and action. One significant finding of recent years is that "female-headed households" have disproportionately lower income, less land under cultivation, and less access to credit and other services than male-headed or joint households. The use of the female-headed household as an analytical 'lens' on gender differentiation in development has provided an effective route to understanding gendered patterns of disadvantage and to finding ways of redressing such disadvantage (eg. Merrick and Schmink 1983; Youssef and Hefler 1983; Rosenhouse 1989). On the other hand, the research and associated policy work has raised certain shortcomings of the concept of female-headed household (eg. Peters 1983; Bush et al. 1986).

Field research in Africa (as well as other regions but here I restrict my discussion to the former) has revealed that the category of female-headed households is heterogeneous; that is, female-headed households differ considerably among themselves. Not all female-headed households are poor, not all are without male labor or male income, not all cultivate a lower mean area than male-headed households. In short, some female-headed households may resemble male-headed households in terms of assets, income, and consumption

patterns more than they do other female-headed households. Consequently, if female-headed households are analysed as a single, undifferentiated group, some of the determinants and dynamics of production and consumption are obscured. Moreover, while it is important to distinguish households by their composition and gender of head, a focus on these characteristics is insufficient in itself. There is a danger in assuming that analysis taking account of female-headed households is equivalent to analysing gender differences. This is not the case. For example, a simple contrast between male-headed and female-headed households may also obscure the role of gender and the different experience of women within male-headed households.

The point of stressing the necessity but insufficiency of identifying gender of head of household is to argue that analysis should start not with "female-headed households" or with "women" but with gender. Like "men", "women" is too undifferentiated a concept. As explained above, the category of "female-headed households" has similarly masked the heterogeneity among households. Since 'gender' is a relational rather than an essential concept, it focusses attention not on social categories assumed to be homeogeneous but on gender relationships that are assumed to be variable. Hence, starting with gender as the conceptual framework enables us to recognise that gender is one dimension of social difference and that it interacts with other differences -- of age, income, wealth, resources, class, caste, region, and so on. The implication for the analytical frameworks and methodologies which guide research, policy formation and program or project implementation is that serious account must be taken of different categories of individuals or households among the 'target' population. Gender is a major dimension of difference and should be included with others such as those mentioned. Obviously, the range of relevant differences will vary by

type of research, policy or program.

DESCRIPTION OF THE RESEARCH

The research which forms the basis for this paper was conducted in the southern part of Zomba district in the Shire Highlands of Malawi. The six village clusters are situated some fifteen miles as the crow flies from the plateau of Zomba mountain, in a relatively well-watered area of rolling hills. The research site falls within land that once formed one of the largest European-owned estates in southern Malawi, long since broken up into a patchwork of a few small Malawian-owned estates on free- or lease-hold land and many villages on the majority of the land that has reverted to customary tenure. Much of the land was subjected to exploitative use under the early estate, and since Independence in 1964 has been in permanent cultivation by villagers and the remaining estate holders. The study concerns only smallholder farmers on customary land. The area is densely populated: the average household landholding in Zomba South is less than one hectare, though the households in the sample reported on here have an average of 1.5 hectares (largely because the sample includes a larger number of tobacco growers than are present in the wider population).

The study was carried out during 1986-7 among just over two hundred households. Multiple methodologies were employed. A socio-economic survey on area of land cultivated, cropping patterns, labor use, income, expenditures, and child morbidity was conducted by visiting households every two weeks. The results cited are based on ten months' data. All economically active adults were interviewed. Three anthropometric surveys (at the beginning, mid way in the food deficit period, and post-harvest)[1] were carried out on children under six and their mothers/caretakers. Two dietary intake surveys were conducted, one in the

deficit and one in the post-harvest period. All food prepared for the household by the main cook and the portions of one child under six and of the mother/caretaker were weighed. Ethnographic analysis was also conducted, mainly in the village where the author lived (one of the six clusters).

Most of the data reported in this paper come from the 1986-7 research. However, a further round of study was conducted among the same households during 1990-1 and some reference will be made to these data.

GENDER, CHILDREN'S NUTRITIONAL STATUS AND FEMALE-HEADED HOUSEHOLDS

Female-headed households were found to contrast on many characteristics with male-headed households but when they were disaggregated further into three types, they were found to differ among themselves. De jure female-headed households are those in which a woman is the recognised head and has no husband; women are divorced, separated or widowed. De facto female-headed households are those in which a husband is the recognised head but where he is absent fifty percent or more of the time. Finally, because of significant income and other differences, the de facto female-headed households were further divided into the more typical de facto households and migrant female-headed households where the husband was employed in South Africa.

On average, female-headed households have fewer total members than male-headed households and, as expected, have fewer adult men present (see Table 1). They also have lower income and expenditure and cultivate less land than do male-headed households. When female-headed households are disaggregated, migrant households are similar in size to male-headed households while de jure female-headed households are the smallest. Migrant households have the highest dependency ratio (the ratio of children to adults) and female de jure households

Table 1 -- Demographic characteristics and expenditure patterns of sample households

	Males	Females			
		Total	Migrants	De jure	De facto
Household size	6.26	5.64	6.21	5.10	5.90
Adult males	1.29[a]	0.40[a]	0.21[a]	0.31[a]	0.57[a]
Adult females	1.46	1.64	1.57	1.69	1.63
Children	3.51	3.60	4.43	3.10	3.70
Preschoolers	1.76	1.75	2.14	1.48	1.83
Dependency ratio	1.28	1.76	2.49	1.55	1.68
Income per capita	84.15[a]	65.84[a]	117.02	57.11[a]	50.39[a]
Expenditures per capita[b]	81.07[a]	71.66[a]	114.09	63.51[a]	59.74[a]
Percent food	62.00	66.00	58.00	68.00	67.00
Percent nonfood	38.00	34.00	42.00	32.00	33.00

[a]Significantly different from male-headed households at $p < 0.05$.
[b]Kwacha (per 10 months) in Malawi.

the lowest, with the male-headed and female de facto households falling in between.

The income of male-headed households is higher than the mean for female-headed households. This fits with the findings from other countries within and without Africa of the lower incomes of female-headed households. However, not all female-headed households are poorer. The migrant households, in fact, have higher mean incomes than the male-headed households. Per capita expenditures (used as a proxy for income, see Table 1) are just over forty percent higher than those in male-headed households. This reflects the higher incomes that can be earned in South Africa as compared with Malawi, although the wealthiest male-headed households who derive their income from commercial farming have comparable or higher incomes.

In contrast, de facto female-headed households are the poorest in this study. The shortage of land available to these households forces men to find income elsewhere. In fact, these households are de facto female-headed precisely because the husbands have to seek other ways of earning cash as a necessary complement to the income (much in the form of food) derived by their wives from the land. Job opportunities are few and the wage levels of most jobs, including temporary agricultural laboring work which is the most prevalent, are low. Most self-employment (retailing crops, fishing and fish-mongering, small services like carpentry) also generates low levels of income. These de facto female-headed households have per capita expenditures that are a bare half those of the migrant households and slightly below those of the de jure female-headed households.

The level of expenditures is reflected in the availability of food to the households (see Table 2). Caloric intake per adult equivalent is very low in general in the study. On average, male-headed households have higher caloric

Table 2 -- Household caloric intake and child caloric adequacy

	Males	Females			
		Total	Migrants	De jure	De facto
Caloric intake per AEU[a]	1,626[b,c]	1,484	1,870[c]	1,484	1,423[b]
Average household caloric adequacy (percent)	57[b,c]	54	66[c]	52	50[b]
Percent households below caloric adequacy	90.5	90.4	78.6	93.1	93.3
Child caloric adequcy	70.5	70	75.3	68.4	69
Child/household caloric adequacy	1.31	1.37	1.19	1.36	1.48

[a]Adult Equivalency Units
[b]Significantly different from male-headed households at $p < 0.05$.
[c]Significantly different from male-headed households at $p < 0.10$.

levels than female-headed households. De facto female-headed households have significantly lower levels of caloric intake than male-headed households and migrant households, and somewhat lower than those of de jure female-headed households. Calories available to the sample households correlate with measures of income and expenditure. Caloric intake of mothers also correlates with income in the deficit (pre-harvest) season, though not in the post harvest season.

Across the sample, income and expenditures were positively associated with nutritional outcomes (see Table 3). Regression analysis indicated that per capita income explained a significant proportion of variance in household, maternal and child energy intake in the deficit period but not in the post-harvest survey. These findings and the much lower energy intake elasticity to post-harvest income suggest that households that have small maize supplies and low cash resources are highly vulnerable during the season of scarcity, whereas immediately after the harvest, differences among households diminish.

However, the gender of household head has an effect independent of level of income. Despite the lower incomes and lower levels of caloric intake among female-headed households, the anthropometric means for children in those households are as good as or better than those in male-headed households. Children in male-headed households have an average weight for age Z-score of -1.45 and height for age of -2.41 compared with -1.38 and -2.31, respectively, for those in female-headed households. More indicative is the prevalence of malnutrition among children in each category of households (see Table 4). For example, the proportion of children with Z-scores less than -2.0 (moderately to severely malnourished) for height for age is 62.3% for male-headed households compared with 55.9% for female-headed households. Children in de facto female-headed households have the lowest rate rate of stunting, at 51.2%.

TABLE 3. Correlations of child size (in terms of Z-scores) with household variables

Variable	Height-For-Age	Weight-For-Age	Weight-For-Height
Total household income	0.14520[x]	0.20178[x]	0.15543[x]
Total expenditures per capita	0.20646[xx]	0.22630[xx]	0.11777
Production used for own consumption	0.13790[x]	0.20927[xx]	0.15953[x]
Tobacco as a percent of crop income	-0.04289	0.00049	0.06642
Hectares cultivated by households	0.07037	0.13702[x]	0.14433[x]
Households' harvest (in kilograms)	0.11581	0.21628[xx]	0.20346[xx]

n = 215-217

x = Significant at 5 percent level.

xx = Significant at 1 percent level.

Table 4 -- Nutritional status and morbidity of preschoolers

	Males	Females			
		Total	Migrants	De jure	De facto
Z-scores:					
Weight-age	-1.45	-1.38	-1.53	-1.23	-1.42
Height-age	-2.41	-2.31	-2.64	-2.16	-2.24
Weight-height	-0.06	-0.05	-0.06	-0.16	-0.04
Percent with Z-scores less than -2:					
Weight-age	28.4	23.5	36.0	17.7	20.9
Height-age	62.3	55.9	64.0	55.9	51.2
Weight-height	0.9	0.0	0.0	0.0	0.0
Percent of total time:					
Ill	21.80	22.80	19.00	27.20	21.10
Ill with diarrhea	1.84	1.90	1.63	2.39	1.63

Chapter III.11

How can one account for the lower level of malnutrition among children from female-headed households, particularly the de facto female-headed households, given the significantly lower income of these households?

One possible reason is that the de facto female-headed households appear to allocate a higher proportion of their total budget to foods and a higher proportion of their total food calories to their small children. The de facto female-headed households have the highest levels of child calories (see Table 2). Although their per capita expenditures are only 74% of those of male-headed households, the de facto households provide a level of household caloric adequacy that is 88% of that among the male-headed households. Moreover, these de facto female-headed households are able to ensure a level of child caloric adequacy that is 95% that of the male-headed households (see Table 4). Another reflection of this allocation pattern is in the ratio of child caloric adequacy to overall household caloric adequacy: this is 1.48 for de facto female-headed households compared with 1.31 for male-headed and only 1.19 for migrant female-headed households.

The fact that the richer migrant households do less well in terms of caloric adequacy and nutritional status than their higher incomes would lead one to expect brings into relief two related conclusions. There is not a direct one-to-one effect between a rise in household income and the level of children's nutritional status. And, secondly, the gender of the head of household has more effect on children's nutritional status at low levels of income than at higher. For example, we noted above that, despite the higher incomes and household calories of the migrant female-headed households, their children receive a smaller proportion of available calories than other (female-headed and male-headed) households. Possible reasons include the following. This may reflect

differences in the pattern of food expenditures. As income rises in this sample, more "adult" foods are purchased such as meat, fish, tea, processed breads and cakes, and other expensive foods that usually do not directly increase the caloric intake of toddlers and infants. This pattern holds for female-headed households as much as for male-headed households. Thus, although total calories are increased with higher income/expenditures, the particular form of calories obtained does not necessarily improve the nutritional status of small children.

In addition to the pattern of food expenditures, there may be a perceptual issue related to level of income/wealth. Thus, it appears that the poor female-headed households, perceiving clearly their shortage of food, try to compensate by giving their small children a disproportionately larger share of available food. When income rises and, in this sample, this includes an increase in maize and other foods available to the household, the overall perception is that 'we have lots of food' and extra efforts are not applied to the feeding of small children. Thus, the expected positive effect of higher income on children's nutritional status does not come about, even among female-headed households.

The type and timing of income might also be a factor in the relationship. The migrant households have a much higher income, on average, than other female heads but the irregularity of remittances and their "lumpy" quality might incline the recipients to spend on other things than the daily requirements of small children. Also, migrant earnings may be short-lived, lasting no more than a few years for some women and thus, not having the time to positively affect the small children.

Similarly, the role of home produced food (especially the staple, maize) as a component of income may be significantly related to the effects on child nutrition. Between 1987 and 1990-1 the proportion of income deriving from home-

produced and retained maize increased for the entire sample of households for reasons that, I have argued elsewhere, have to do with increasing concern about food security and the volatility of the food market. This increase was particularly marked among the de facto female-headed households. In contrast, the de jure female-headed households proved to be the only ones not to increase the share of home-retained maize in income, had the lowest incomes and expenditures, and the lowest Z-scores for their children. These households appear to have lost ground between 1986/7 and 1990/1.

A further reason why the gender of head appears to have a more positive effect at lower levels of income is a gender effect in expenditures. The expenditure data (for 1986-7) showed that women spent a higher proportion of their budget on foods compared with men, and men spent a higher proportion of their budget on alcoholic drinks and agricultural inputs, especially fertilizer. Moreover, the men in poorer male-headed households put a proportionately higher share of their expenditures into drink than the less poor. At lower levels of income, such a difference in shares may help explain why female-headed households are able to achieve higher levels of caloric adequacy for their children than do male-headed households. As noted above, this does not hold for the better-off households.

On the other hand, the fact that one part of the gender difference in expenditures relates to agricultural inputs, which should increase overall production, suggests a longer term effect on overall income that requires more analysis. One indication that expenditures by both men and women adjust to changing circumstances is that the 1990-1 data showed an overall increase in the share of home-retained maize in total income for both male-headed and female-headed households. Similarly, proportionately more of cash expenditures were

spent on agricultural inputs, especially fertilizer, and less on drink and non-staple foods by both male-headed and female-headed households, and at all levels of income. Since there was also a large increase in the proportion of households growing hybrid maize and in the share of land grown in hybrids, these findings suggest an overall increase in concern about both present and future food security.

Yet another influence on the relations among income, gender and children's nutritional status is the work of women. For example, if an increase in household income is achieved at the cost of an increase in total work by women, this might translate into less time spent on preparing food and/or on child care. The extremely labor-intensive work involved in tobacco production for the wives as well as for the husbands, for example, is likely to be one reason why children in these households, despite the average higher income, do not do any better in terms of caloric intake or anthropometric measures than non-tobacco growing households. Only in the wealthiest tercile of households was there a significantly higher caloric intake (in the deficit period only) compared with households not growing tobacco. It is precisely these wealthier households who can afford to hire sufficient laborers to reduce the work burden of wives. Another indication of the influence of women's work is in the 1990-1 data which show that the de jure female heads have to spend more time on earning income away from home and the home farm. This absence and what it implies for food preparation for small children may be a factor in the tendency among these households to have children with lower levels of nutritional status.

Finally, in this sample, the potentially positive effects of increased income and increased food availability on children's nutritional status were diminished by the high levels of morbidity. Sickness tends to have a levelling

effect. The number of days sick for a child tended to have a stronger effect on a child's nutritional status (as measured anthropometrically) than vice versa. Unlike other studies conducted in Africa (eg. Kennedy 1987 on Kenya), there were no significant differences found between male-headed and female-headed households with regard to children's sickness in this sample.

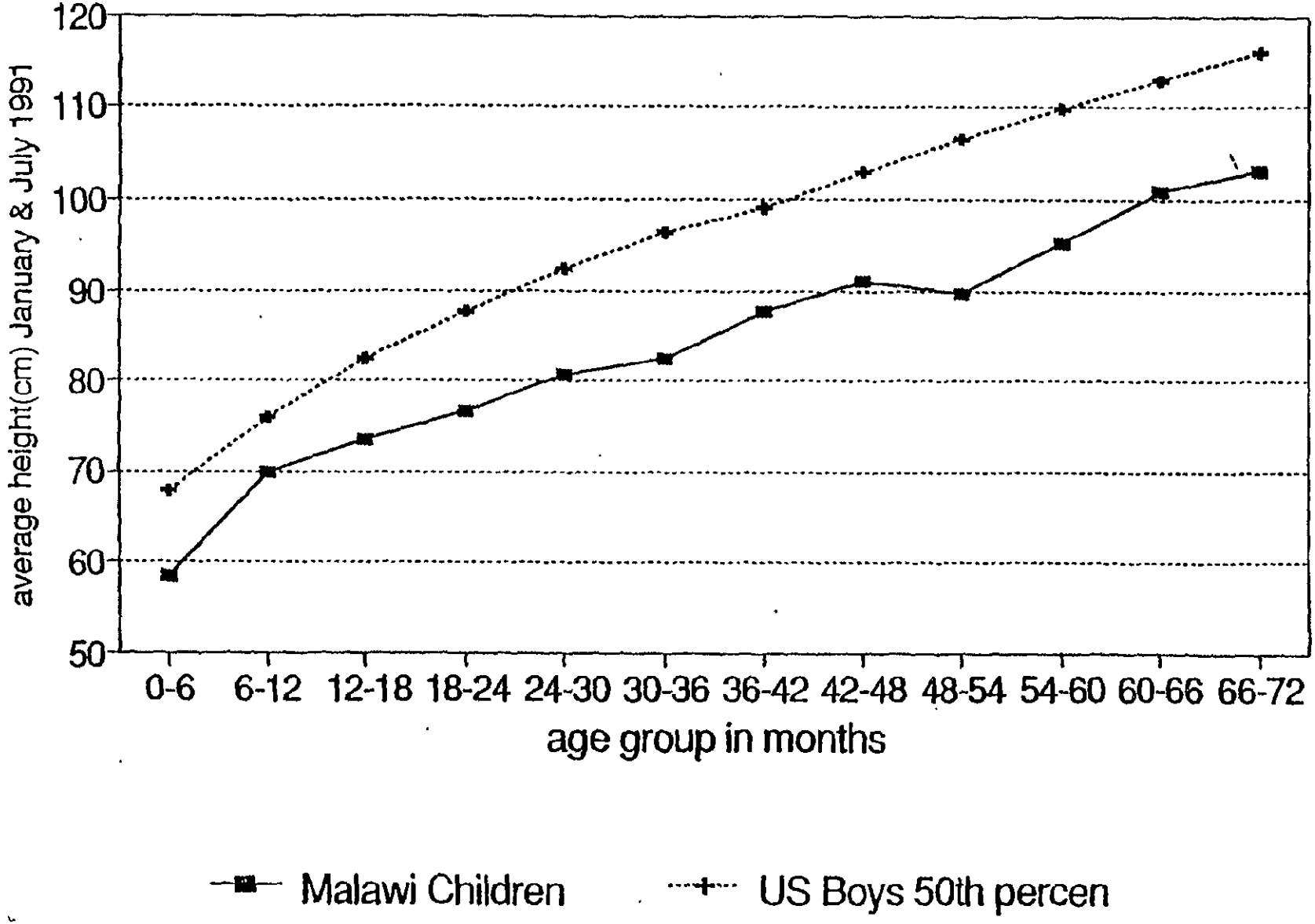
CHILD SURVIVAL, MATERNAL HEALTH AND WOMEN'S WELFARE

The survey data on children's nutritional status reported here resemble closely the Malawi national data for rural children. These portray a chronically stunted population: children in the sample were moderately stunted with a mean height for age 91% of the NCHS standard median and moderately underweight with a mean weight for age 87% of the standard. Mean weight for height approached 100% of the standard. Since the study sample somewhat over-represented the better-off, their anthropometric measures were slightly better than the national rural surveys which show that 56% of children are moderately stunted (height for age less than -2.0). There is a strong seasonal fluctuation in measures, with mild to severe malnutrition increasing in the pre-harvest "deficit" season, when food is scarce and morbidity, especially diarrhoea and fever, highest. The study sample shows that children's height for age becomes progressively worse as they grow older -- this progressive fall in growth velocity is a classic index of a chronically stunted population (see Figure 1).

Although growth velocity slows through childhood, even the smallest babies (under six months) were found to have low anthropometric scores. This reflects not only the post-natal pattern of weight loss for infants but almost certainly the mean low birth weights of babies, which is one of the dysfunctional effects of stunting among adult women.[2]

1990-91 HIID MALAWI RESEARCH PROJECT
ATTAINED HEIGHT BY AGE GROUP

FIGURE 1



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Malawi women are short, on average, but their average BMI of 21.01 is equivalent to other African samples and better than the South Asian groups (see cases in this volume).[3] Income is positively correlated with BMI (see Table 5). The much larger difference between the top tercile of income and the bottom two terciles in the proportion of women with BMI less than 18.5 undoubtedly reflects the highly skewed distribution of income in the sample.

As with the nutritional status of children, women's mean BMI show a marked seasonal fluctuation (see Table 5). Again, this is seen most dramatically in the percentage of women with BMI less than 18.5. The women in the bottom income tercile, in particular, appear to make a marked gain in BMI during the post-harvest season when the supplies of staple maize are at their peak and when there is feasting and a sense of plenty in the villages.

Mean BMI is lowest for women over sixty years of age; it fluctuates around 21 for women in categories between fifteen and fifty, rises to 22.4 for women in their fifties, then falls. Women reporting being sick in the previous two weeks of the survey have a lower mean BMI than those not sick.

No significant difference is found in women's BMI across the sample by gender of household head (see Table 6). The mean BMI for women in male-headed households is 21.02 compared with 20.98 for those in female-headed households. More unexpected is that the mean BMI is higher for women in the de jure female-headed households (21.46) than those in either the de facto female-headed (20.59) or male-headed households (21.02). When we consider the seasonal fluctuation (see Table 7), we find that the higher all-round average of women in the de jure female-headed households derives mainly from their post-harvest BMI, whereas in the deficit period (January survey), they do slightly worse than women in the male-headed households. Women in the de facto female-headed households do worst

TABLE 5. MALAWI WOMEN'S BMI AND INCOME

Terciles of Income 1 = Lowest	1	2	3	Total	N
Mean BMI	20.68	21.10	21.24	21.01	(129)
% BMI < 18.5	23.3	20.9	9.3	17.8	(129)
Deficit Season					
Mean BMI	20.18	20.84	21.36	20.79	(129)
% < 18.5	25.6	20.9	9.3	18.6	(129)
Post Harvest					
Mean BMI	21.19	21.36	21.12	21.23	(129)
% < 18.5	9.3	18.6	11.6	13.2	(129)

TABLE 6. MALAWI WOMEN'S BMI, INCOME AND GENDER OF HEAD OF HOUSEHOLD

Income Terciles	Male Headed	Female Headed	De Jure	De Facto
1	20.44	20.08	20.98	19.66
2	20.95	21.94	21.77	21.86
3	21.66	20.93	21.62	20.24
Total	21.02	20.98	21.46	20.59
N	(93)	(36)	(15)	(18)

TABLE 7. SEASONAL FLUCTUATION IN WOMEN'S BMI, INCOME AND GENDER OF HOUSEHOLD HEAD

DEFICIT SEASON

Income Terciles	Male Headed	Female Headed	De Jure	De Facto
1	20.17	19.15	20.23	18.64
2	20.88	21.87	21.81	21.55
3	21.69	20.17	20.43	19.95
Total	20.92	20.44	20.88	20.05
N	(95)	(34)	(16)	(18)

POST HARVEST

Income Terciles	Male Headed	Female Headed	De Jure	De Facto
1	20.85	20.78	21.74	20.70
2	20.91	22.46	22.15	22.18
3	21.55	21.38	22.31	20.54
Total	21.10	21.54	22.07	21.14
N	(93)	(36)	(15)	(18)

in both seasons. When income is added to this mix (gender of head and season), no clear trends appear.

The main issue arising here is why women in de jure female-headed households have a higher BMI, especially in the post-harvest season, than women in other households whereas their children's anthropometric scores are the poorest. Present hypotheses, which require further research and analysis to verify or discount, are that since women in the de jure female-headed households obtain much of their income from off-farm work (casual labour, retailing crops) or from gifts (from adult children or from lovers), many of these compensations, whether cash or in-kind, take place away from the home and are therefore less likely to benefit the small children than the women themselves. In contrast, women in de facto female-headed households put more emphasis on farm production, especially maize, legumes and vegetables (hoping for cash from their husbands), and are at home and in the home fields most of the time. Male-headed households, some of whom are considerably better off than female-headed households, derive most of their income from farm production, especially cash crops of tobacco, maize and vegetables. In these households, women work long hours in agricultural production along with their husbands and it is likely that the very high levels of work performed by these women, as well as by women in the de facto female-headed households, result in lower mean BMI scores. This may also account for the less clear positive effect of higher income on women's BMI when households are disaggregated by gender of head.

Women who are undernourished and undersized will tend to have small babies, and those who are anaemic and sick with other ailments will tend to have premature, small and/or sickly babies, and not have as much milk for feeding as they should. The average age at first birth in the sample was just over eighteen

years of age. While we do not yet have data on the age of first menses, this is probably later than among better nourished girls -- around sixteen or seventeen rather than thirteen. Preliminary information suggests that women in Malawi tend to have their first child within a year or two of first menses. Some older women suggested that the age has declined over the past few generations but we do not yet have good evidence on this. Births are also said to be more closely spaced than in the past, with an average (in this sample) of twenty-four months between pregnancies. Our data suggest that the first child is more vulnerable to dying early than later children. This, like the other issues raised above, needs further research. Finally, hospitals and clinics report high levels of perinatal problems for women, many of whom reach hospital only at times of crisis (which obviously makes it difficult to have good data on overall incidences of problems).

The low level of mean income, the high burden of work, and the stunting among rural women in the study indicate that women become pregnant and bear children in difficult circumstances. Babies are small and quickly lose weight; it is not surprising, though tragic, that one in three children die in Malawi (320 per 1000 and 151 infants per 1000). As noted above, data from the 1986-7 study suggest that poor women allocate disproportionately more of the available household calories to their small children. Assuming this translates into lesser weight gain for poor women, this behavior, combined with the seasonal shortages of food, which coincide with high levels of work and morbidity, and with the drain of repeated pregnancies, reproduces a pattern of under-nourished mothers and children. Stunting is reproduced over the generations.

The relations among poor nutrition, food shortages, sickness and heavy work burden are apparent among poor women in Malawi. To the extent that undersized

women produce undersized babies who, in turn, are more vulnerable to sickness and death, then stunting is dysfunctional, contrary to the hypothesis that stunted people are "small but healthy". This hypothesis was formulated in relation to a debate that took place in the late seventies and early eighties about the definition and incidence of "malnutrition" in India (Messer 1986). On one side were those who argued that recommended intakes (by FAO/WHO, for example) are based on western populations and are higher than is biologically necessary, that "malnutrition" is thereby exaggerated in countries such as India, and that stunted populations are "small but healthy" in that they apparently suffer no dysfunctional consequences (Sukhatme and Margen 1978, 1982; Srinivasan 1981; Seckler 1977, 1982).

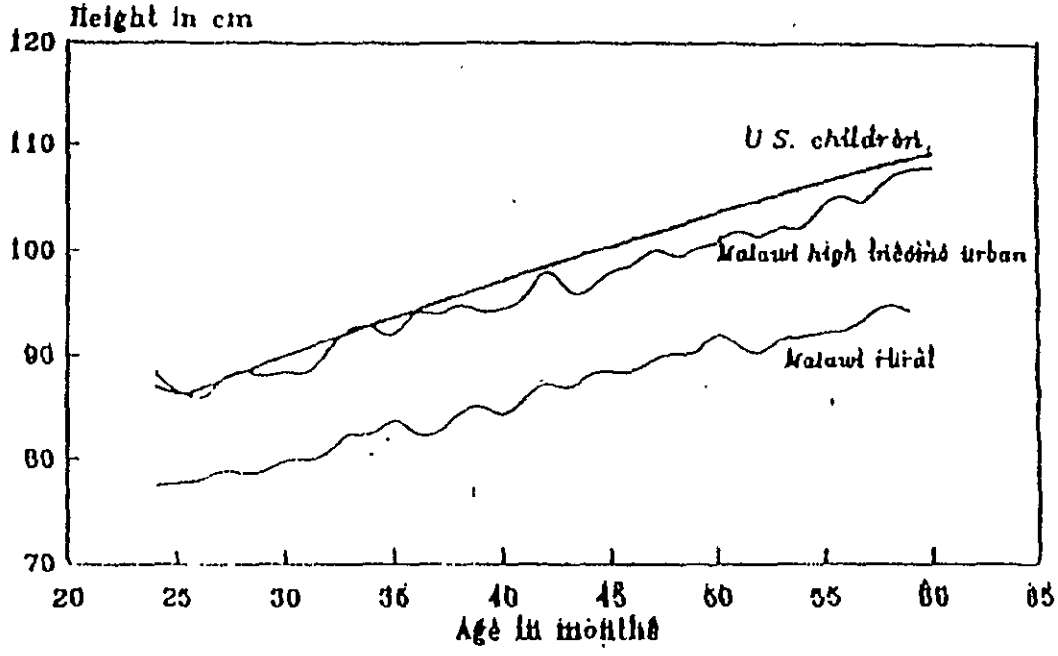
On the other side of the debate were those who argued that there is no reliable evidence for metabolic adaptation to low levels of caloric intake and that there is evidence that chronically malnourished (ie. stunted) people suffer from diminished work and activity levels, poorer resistance to illness, and decreased longevity (Gopalan 1983; Torun, Young, and Rand 1981; Rand et al. 1984). Part of the refutation of the "small but healthy" thesis depended on data showing that children of better-off groups were taller and heavier than those of the poorer groups in an otherwise (ethnically, etc.) similar population. In other words, it seemed that the ability to provide sufficient levels of food and other needs (especially health care) was responsible for the different levels of nutritional status rather than population-wide characteristics.

As noted, the sample data reported on here resemble the national data on rural children in Malawi: all portray a chronically stunted population. However, a recent anthropometric survey of children from wealthy families in the three largest urban centers of Malawi shows measures that are extremely close to the

international standards (see Figure 2). Thus, as with the Indian data, the urban study indicates the potential for all Malawian children to be taller and heavier. Stunting is not inevitable. Moreover, and most significantly, the incidence of stunting indicates not merely an undersized population but a population of survivors. These stunted individuals are those who have survived the onslaughts of food deprivation and high levels of sickness. There are many who do not survive; as noted above, Malawi has some of the highest rates of infant and child mortality in the world. The stunting, therefore, is best seen as a surface reflection of death. A large, stunted population is an index of poor child survival. The research suggests that the determinants of child survival include seasonal and overall food availability, income or purchasing power, sickness and its treatment, and feeding practices.

A key phase in the pattern of reproduced stunting is that of weaning. It is children of the age of weaning, between nine and twenty-four months, who appear to be at greatest risk of dying. The problems here also turn very much on the poverty of most women. The local weaning food is a thin gruel of maize flour and water. Although most women can recite the messages heard at clinics (and on the radio) about the "three food groups" and the positive effects of adding soybean, bean or groundnut flour to the gruel, most cannot afford to do so. Even if they grow such crops, they usually are compelled to sell them to obtain cash for other needs (staple maize, clothes, medicines, school fees). Additionally, in the planting (and weeding) time of the year, which is when food is at its scarcest, and sickness, especially diarrhoea, at its peak, women's work requires them to be long hours in the fields. They describe how they are forced to delay breast-feeding their babies and to reduce the number of times they prepare meals at the home. Given the demands on their own energy levels, this

Fig 2. Nutritional Status in Malawi by Socio-economic Groups: Average height by age in children 24-60 months



Urban nutrition survey 1990 (FSNU/EP&D)
Rural data from 1980 National survey by
MOLG/UNICEF nagrps

situation reads into one of deprivation for infants and small children. The seasonal effects on nutritional status noted above, then, involve mothers' work and time as well as the effects of prevalent sickness and shortage of food.

In short, to counter the effects of stunting -- to reduce morbidity and mortality -- one needs to consider gender as one dimension, in interaction with other social characteristics, in any analysis of nutritional status or, more broadly, of production and consumption.

Chapter III.27

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1.In a normal year, rains fall from November through early April with planting beginning in late November or December and the maize harvest in Aprio-May. During December and January, food supplies are at their lowest, field work at a peak, and malaria and diarrhoea very high.

2.We have very little data on birth weights. In the 1990-1 survey, we weighed and measured seven newborns: all were on the margin of low birthweight status (2500-3000 grams) with most weighing exactly 2500 grams.

3.The BMI data are derived from the 1990-1 survey.

Chapter IV.1

TRANSFORMATION OF SMALLHOLDER AGRICULTURE IN THE WESTERN HIGHLANDS OF GUATEMALA AND THE BODY COMPOSITION OF ADULT WOMEN AND MEN

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INTRODUCTION

Adult body composition, and its determinants in populations suffering from chronic energy deficiency in developing countries, have only recently become a focus of scientific inquiry. A great deal of work has centered on measurement of adult body composition, particularly under field conditions, and on identifying valid, reliable and low-cost indicators.

In the present paper the determinants of men's and women's body composition are examined in a farm population in the Western Highlands of Guatemala. This represents an area where since the early 1980s the government has attempted to promote crop diversification among smallholder farmers, focusing on cold weather vegetables and animal production, as an income-generating strategies. The traditional crops in this region are maize and beans, grown both for domestic markets and home consumption. The area is predominantly inhabited by indigenous populations, and can further be characterized by a lack of adequate rural infra-structure and generally poor access to markets, low agricultural productivity (partly due to continuous environmental degradation), and small and dispersed landholdings. Seasonal work on

sugar and coffee plantations in the lower coastal areas remains a main source of off-farm employment for this farm population.

Both access (or intake) of food, and energy expenditure levels determine adult body composition. Energy expenditure levels in adults principally depend on time allocation and activities patterns. Body composition in rural men in Guatemala has been shown to be associated with different relative shares of time spent in high and low energy-intensive activities (Viteri 1971; Viteri and Torún 1975). The energy costs of activities that rural women in Guatemala engage in, have been shown to vary significantly between activities, and between women in the same activity (Torún, McGuire and Mendoza 1982). Rural men may also maintain rather stable body composition in the face of increased energy expenditure at work, suggesting adjustments in time allocation among high- and low-energy activities, and/or in. daily energy intake (Immink et al. 1987).

No daily energy expenditure studies among adults engaged in diversified cropping patterns have been undertaken. Yet, a number of studies, conducted in Guatemala and elsewhere, have shown that a shift in on-farm production towards vegetable production involve changes in time allocation for men and women towards on-farm production activities, possibly for men away from off-farm employment and for women away from domestic tasks, including child care (von Braun, Hotchkiss and Immink 1989; Immink and Alarcon 1993). Vegetable production is also considerably more labor-intensive than maize and beans.

Chapter IV.3

In this study we examine the association between adult body composition and crop diversification patterns among smallholder farmers. We postulate that men and women on diversified and non-diversified farmers have similar body compositions in the population, as higher daily energy expenditure levels on diversified farms are offset by greater access to food through a positive income effect associated with crop diversification.

The body mass index (especially the Quetelet index) has most prominently been proposed as a diagnostic tool to classify adults according to their chronic energy deficiency status (James et al 1988). New evidence questions the universal validity of this indicator (Norgan 1990; Immink, Flores and Díaz 1992). A number of other body composition indicators besides the Quetelet index (weight/height^2) are included in this study, as the latter has been shown not to provide reliable and valid estimates of chronic energy deficiency (CED) status in this population, particularly among those seriously suffering from CED (Immink, Flores and Díaz 1992). In this case, it is to be expected that the determinants of body mass index values, and of other body composition indicators (fat-free mass, fat mass and fat proportion) may differ, which in turn raises certain methodological questions.

METHODS

The present study combines data from two different sources for the same rural population: a farm production and household expenditure survey conducted in February-March 1987 by the Ministry of

Agriculture, Livestock and Food (MAGA), and a food intake and anthropometry survey conducted eight months later by the Institute of Nutrition of Central America and Panama (INCAP). The MAGA survey was conducted among 1,490 small holder farm households in the Western Highlands of Guatemala,[1] selected by means of a two-stage random selection method, while the INCAP survey was undertaken in a sub-sample of 906 households, selected by means of a single-stage conglomerate method with communities as the conglomerates.

The farm production and household expenditure survey included data related to cropping patterns, farm size, use of production inputs, land use, household and hired labor inputs by crop, crop production and destination (market, household consumption, animal feed, seeds), and expenditures by item. The household income variable was calculated as the total sum of food and non-food expenditures and the market value of own produced crops consumed by the household.

Household food intake was measured by means of the 24-hour recall method, with weighing of household portions. The data were converted into daily energy, protein and micronutrient intakes using the Central American Food Composition Table (INCAP 1971). To calculate household adequacy levels for daily energy and protein intakes, gender- and age-specific recommended daily allowances were applied (INCAP 1973). The daily energy intake adequacy was thus not based on actual daily energy expenditure, and may under- or over-estimate the actual adequacy level. Seasonal variations in daily energy expenditure are also not

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[1] The study was conducted in the Departments of Sololá, Quezaltenango, El Quiché, Totonicapán, San Marcos and Huehuetenango.

accounted for. For this reason, the calorie adequacy variable was categorized in the analysis to minimize the effect of these measurement errors.

The following anthropometric measurements were obtained in one male and one female adult in each household: weight, height, mid-upper arm circumference and skinfolds at four sites (biceps, triceps, suprailiac and subscapular). All measurements were made in accordance with Weiner and Lourie (1969). Arm circumference was measured with a metal tape, and the skinfold measurements with made were a Lange caliper, both with a 1 mm sensitivity. The body mass index was calculated as weight/height squared. Body fat proportion was estimated follows. Estimates of body density were obtained with the age-and gender-specific equations found in Durnin and Womersley (1974), based upon the sum of skinfolds. Applying Siri's equation (Siri 1956), estimates of body fat proportion were obtained. This method has been shown to estimate body fat content in this population with low precision and validity; for this reason a second approach, described in greater detail in Immink, Flores and Díaz (1992), was applied. Based upon the results of a validation study in a similar population in Guatemala, gender-specific prediction models were identified with the "best subset" of all available anthropometric indicators as predictors of fat-free mass. The fat-free mass estimates used in the validation were obtained by densitometry methods. The best subset equation for women consisted of biceps skinfold and weight, and of height, weight/height^2, and biceps and

suprailiac skinfolds for men.[2] The predicted fat-free mass values were subtracted from body weight to obtain estimates of fat mass.

FINDINGS

The two samples of women and men represented a wide range in ages (Table 1). The mean body mass index (BMI) indicated that the men were generally lean, and could be classified as mildly undernourished (8.6 percent fell below 18.5 kg/m sq.). Yet, the mean for fat mass indicated that these men might generally suffer from severe undernutrition, when compared to the results of a study of rural males in Colombia (Barac-Nieto et al. 1978). Their average percent fat was only a few percentage points above a fat proportion of 6 percent which is considered the lower limit compatible with normal body function and health (9.1 percent fell below 6 percent) (James et al. 1988). The women were on average much closer to the lower limit of fat proportion of twenty percent, and a significant number fell below this limit (36.9 percent), even though mean BMI would generally suggest no serious undernutrition problem in this group of women (1 case below 16, and 4.8 percent below 18.5 kg/m sq).

The body composition parameters were disaggregated by farmsize class and cropping patterns, as a first approximation to examine differences in women's and men's body composition associated with different food access and on-farm labor demand characteristics (Tables 2 and 3). Households were classified according to cropping patterns

[2] These equations, estimated by linear regression techniques, produced root mean square errors of 2.25 kg in women, and 2.07 kg in men (Immink, Flores and Diaz 1992).

Table 1--Body composition indicators of adult men and women in the Western Highlands of Guatemala

Indicator	Women (752)			Men (672)		
	Mean	SD	Range	Mean	SD	Range
Age (yr)	33.8	9.5	15-69	42.2	13.6	15-82
Weight (kg)	47.8	6.8	30-85	53.0	7.1	36-85
Height (m)	1.46	.06	1.20-1.73	1.57	.06	1.40-1.81
BMI (kg/m^2)	22.5	2.8	15.2-36.8	21.4	2.4	15.8-33.3
Fat-free mass (kg)[a]	36.9	4.3	24.8-61.1	47.0	5.4	32.6-69.7
Fat mass (kg)[b]	11.0	3.1	4.2-36.2	5.9	2.2	1.9-15.9
Fat proportion (%)[c]	21.5	4.0	9.2-34.0	10.7	3.8	0.5-25.7

a) Estimated with "best subset" equations (Immink, Flores and Diaz 1992).
b) Fat mass, estimated as weight minus estimated fat-free mass.
c) Estimated with Durnin-Womersley (1974) and Siri (1956) equations.

as follows: (a) maize and/or beans ("maize farmers"), (b) maize and/or beans and potatoes ("potato farmers"), (c) maize and/or beans and/or potatoes and wheat ("wheat farmers"), and maize and/or beans and/or potatoes and vegetables ("vegetable growers").

Results from this study, which have been reported elsewhere, indicated that: (i) positive per capita income differentials existed between diversified farm households and maize farmers, and that these differentials were smaller on larger farms, (ii) household consumption of own-produced foods constituted a small proportion of total household income (ranging from 3% for maize farmers to 5-9% for diversified farming households), (iii) vegetables and potatoes were more labor intensive than maize, so that crop diversification created new on-farm labor demands which were partially attended to by household labor, particularly on smaller farms, and (iv) potato farmers' households were more vulnerable to inadequate daily energy intakes than households in the other three among which the risk did not significantly differ (Immink and Alarcon 1993).

Women's mean BMI's did not differ significantly between cropping patterns and farmsize class, according to the results obtained with the Scheffe multiple range test (Table 2). On the smaller farms, women from vegetable growing households had significantly higher fat proportions on average than women from maize farmers' households; however, no significant differences in mean fat and fat-free mass were present. Among women on larger farms, those belonging to wheat-producing units generally had more fat and fat-free mass than women from maize farmers' households, perhaps reflecting that wheat

Table 2--Body composition of adult women, by farmsize class and cropping patterns, Western Highlands, Guatemala

Body Composition Indicators:	Mean (SD)							
	<1 ha.				≥ 1 ha.			
	MF	PF	WF	VG	MF	PF	WF	VG
	(171)	(85)	(37)	(62)	(74)	(75)	(56)	(80)
Body Mass Index (kg/m^2)	22.0 (2.6)	22.3 (2.3)	22.2 (3.7)	22.7 (2.8)	22.2 (3.0)	22.9 (2.9)	23.2 (2.8)	23.3 (2.8)
Fat-free mass (kg)[a]	36.3 (4.0)	36.6 (3.8)	36.7 (6.0)	36.6 (3.7)	35.9[||] (4.7)	37.2 (4.3)	38.3[||] (4.3)	37.7 (4.5)
Fat proportion (%)[b]	20.6[||] (3.4)	20.8 (3.8)	20.7 (4.3)	22.5[||] (3.6)	22.3 (4.1)	22.2 (3.9)	22.9 (4.8)	22.6 (4.4)
Fat mass (kg)[a]	10.5 (2.6)	10.4 (2.5)	11.0 (3.9)	11.4 (2.6)	10.4[||] (3.0)	11.0 (2.9)	12.3[||] (3.7)	11.9 (4.4)

[a] Calculated with the best subset equation approach.
[b] Calculated with the Durnin-Womersley and Siri equations.
[||] $p < .05$; Scheffe multiple range test.
MF: maize farmers
PF: potato farmers
WF: wheat farmers
VG: vegetable growers

production was the least labor-intensive of all crops, with a greater share of total labor supplied by hired workers.

The pattern of differences in mean body composition among men varied from that of women. These gender differences will be further explored below. Men from vegetable-growing households had generally higher BMI's than maize farmers, particularly on larger farms (Table 3). Maize and potato farmers had significantly different mean fat-free mass values in both farmsize classes, whereas on larger farms maize farmers had also significantly lower values compared to wheat farmers and vegetable growers. No significant differences were found in fat proportion and fat mass values, which tended to be highest among vegetable growers.

It is interesting to note that compared to the other three body composition indicators, the BMI appeared to be less sensitive in detecting differences in average values between sub-groups of adult men and women. Comparing sub-group means, the relative rankings among sub-groups also varied with different indicators. No consistent association between farm size and cropping patterns, and adult body composition emerged from this analysis.

In order to extend the analysis and examine the determinants of adult body composition, three simple models were specified and estimated. The model specifications are conditioned by the data availability.

(a) Income function:

- per capita income = f(per capita farm size, adult human capital stock, cropping patterns)

Table 3--Body composition of adult men, by farmsize class and cropping patterns, Western Highlands, Guatemala

Body Composition Indicators:	Mean (SD)							
	<1 ha.				≥ 1 ha.			
	MF	PF	WF	VG	MF	PF	WF	VG
	(155)	(70)	(36)	(48)	(73)	(63)	(61)	(75)
Body Mass Index (kg/m^2)	21.0[1]	21.4	20.9	22.0[1]	20.9[1]	21.4	21.6	22.4[1]
	(1.9)	(2.4)	(2.3)	(2.6)	(2.3)	(1.8)	(2.8)	(3.1)
Fat-free mass (kg)[a]	45.2[1]	47.5[1]	45.3	47.3	45.3[1,2,3]	48.1[1]	48.4[2]	49.1[3]
	(5.1)	(5.1)	(4.4)	(4.3)	(6.1)	(3.6)	(6.1)	(5.8)
Fat proportion (%)[b]	10.6	10.7	10.7	12.2	10.6	10.2	10.8	11.1
	(3.5)	(3.7)	(4.0)	(4.5)	(3.2)	(3.8)	(4.5)	(4.2)
Fat mass (kg)[a]	5.7	5.9	5.6	6.6	5.6	5.7	6.3	6.5
	(1.7)	(2.2)	(2.2)	(2.5)	(2.0)	(I.8)	(2.8)	(2.7)

[a] Calculated with the best subset equation approach.

[b] Calculated with the Durnin-Womersley and Siri equations.

[1,2,3] $p < .05$; Scheffe multiple range test.

MF: maize farmers
PF: potato farmers
WF: wheat farmers
VG: vegetable growers

(b) Calorie adequacy function:

- household calorie intake deficiency = f(est[per capita income], food budget share).

(c) Body composition function:

- body composition = f(est[risk of household caloric intake deficiency], total household size, on-farm household labor, age).

The last model was estimated separately for men and women. Access to land, and land utilization patterns, can be expected to be important determinants of household income, together with household labor. Marginal returns to land can be expected to be lower on larger farms; as previously indicated, higher per capita incomes are associated with crop diversification. The stock of human capital (adult literacy is the proxy variable here) may be associated with better management of household resources, and with better access to higher paying off-farm employment.[3]

The household daily calorie intake status was postulated to be a function of per capita income, and the percent of income spent on food purchases. The model was estimated with logistical regression techniques, so that the probability of the household having a daily calorie intake below 80 percent of recommended daily allowances is estimated as a function of per capita income and the food budget

[3] For example, we found that when both male head of household and female spouse were literate, the households were more frequently engaged in permanent off-farm work or small business than when one or neither were literate; in the latter case, the household was more likely to be engaged in low-paying agricultural day work.

share. One set of models postulate a re-iterative system, and the predicted values of per capita income are specified as the independent variable.

Adult body composition in this population is postulated to be dependent on relative household food availability, on household labor demands and household labor availability, in addition to age. Total household size and the share of total annual labor days in on-farm work supplied by the households are proxy variables for household labor availability and labor demands, respectively. The probability of the household having a deficient daily calorie intake, as estimated by the calorie adequacy function, is the proxy variable for household food availability. Individual daily calorie intake data for adults were not available, but Kumar and Bhattarai (1992) have shown that household level nutrient adequacy levels are powerful predictors of individual adequacy levels at all ages.

Median per capita annual income was higher among diversified farm households, while traditional farm households showed slightly less income disparity and spent a somewhat higher income share on food purchases (Table 4). But when the value of own-produced foods consumed by the household was added, the total food share of household income differed even less between diversified and traditional farm households. Female literacy was considerably lower than male literacy, and both were slightly higher among diversified farm households. Traditional farm households were slightly more likely to have a more adequate daily calorie intake level. If in addition we

Table 4--Income, food budget shares, adult literacy and household calorie intake of farm households in the Western Highlands of Guatemala

Indicators	All Farm Households (n=754)	Traditional Farm Households (n=289)	Diversified Farm Households (n=442)
Per capita Annual Income:			
Median (Q)	611	565	641
Gini-Coefficient	.30	.27	.30
Food Budget Share:			
Median (%)	41.2	42.1	40.0
Male Literacy (%):	56.6	51.3	59.4
Female Literacy (%):	25.9	22.7	27.5
Household Daily Caloric Intake Status (%):			
<80% RDA	16.9	16.1	17.4
80-100% RDA	25.8	22.8	27.7
>100% RDA	57.4	61.1	54.9

Q = Quetzal; 1987; 1 Quetzal = 0.40 US$

consider that diversified farm households may have higher actual daily energy requirements all year round (due to higher on farm labor demand than traditional farm households), then their actual daily calorie deficiency status may well be under-estimated here.

INCOME DETERMINATION

Per capita income increased with per capita land availability, but at a decreasing rate at the margin (Table 5). The inflection point for all farms appeared to be approximately 6 ha. beyond which diminishing income returns to land start to set in[4]. Male and female literacy were positively associated with per capita income, primarily on smaller farms. Holding farm size constant, a positive per capita income differential was found to be associated with diversified cropping patterns, as we previously saw, but primarily on larger farms. This suggests that a minimum farm size is required before crop diversification provides comparatively higher net returns, although this may only be the case for potato farmers.[5] Off-farm employment

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[4] The inflection point can be determined as follows:

At $\varepsilon = 0$, $p = -(\beta_1/2\beta_2)$ where β_1 = estimated regression coefficient of per capita land, and β_2 = estimated regression coefficient of the squared term: [- .49]/2[- .04] = 6.1 ha.).

[5] These results appear to contradict those reported elsewhere (von Braun et al. 1989) which showed that the largest income differentials were found on the smaller farms. The present study showed that among wheat farmers and vegetable growers the income differentials with maize farmers were indeed larger on smaller farms, but the income differential for potato farmers was negative on smaller farms, while positive on larger farms (Immink and Alarcon 1993). Combining the three cropping patterns into one diversified farming category may produce the results here, in that higher positive income differentials among wheat farmers and vegetable growers were offset by

Table 5--Models of income determination, by farmsize class, Western Highlands of Guatemala

Independent variable:	Dependent variable: ln (per capita income)		
		Farms with:	
	All farms	<1 ha.	≥1 ha.
Per capita land	.49(.05)[d]***	4.15(.60)***	.45(.06)***
(Per capita land)^2	-.04(.01)***	-3.28(1.22)***	-.04(.01)***
Male literacy	.06(.04)*	.11(.04)**	.01(.05)
Female literacy	.07(.04)*	.09(.05)*	.08(.06)
Diversified cropping (yes=1)	.07(.04)**	-.04(.04)	.13(.06)**
Constant	3.61(.07)***	3.24(.09)***	3.63(.10)***
R^2 (adjusted)	.150	.226	.185
F	26.49	24.45	15.44
p > f	.0001	.0001	.0001

[d] Regression coefficient (SE)
*** p < .01
** p < .05
* p .05 < p < .10

by adults was found to be less frequent on larger farms, except for vegetable-growing households. Off-farm employment by children tended to be more frequent on larger farms. But on larger farms, off-farm work by diversified farm households tended to be more often in higher-paying, permanent positions.[6]

HOUSEHOLD CALORIC ADEQUACY

Logistic regression techniques were used to link the risk of a household having an inadequate daily caloric intake to per capita income, and the share of income spent on food. We postulate of course a negative association: the higher per capita income and the budget shares the lower the risk of the household suffering from inadequate caloric intake. Two approaches were used: in one equation the predicted per capita income values from the income function served as the independent variable, and in the second equation measured per capita income (transformed as in the income function in natural logarithmic scale) (Table 6). The models performed poorly. Per capita income was associated with lower risk (models 2 and 4), especially on smaller farms. Holding per capita income constant, the food budget share did not affect the risk of caloric intake deficiency, except marginally on smaller farms. The models with estimated per capita income as independent variable did not fare better (model 1). Weak associations between per capita income and

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[6] The observed negative association between household income and frequency of off-farm employment, for instance, among potato farmers with small farms, was because working off the farm, often in seasonal, low-paying work, was used as a strategy to compensate for low farm incomes.

Table 6--Adequacy of household calorie intake and income, by farmsize class, Western Highlands of Guatemala. Logistic Regressions

Independent variables:	Dependent variable: HH Cal Adequacy (1 = <80%; 0 = ≥80%)					
	All farms		Farms with: <1 ha.		≥1 ha.	
	(1)	(2)	(3)	(4)	(5)	(6)
Est (ln per capita Y)	-1.00[d] (0.65)		-0.92 (0.66)		-1.19 (0.96)	
Ln (per capita Y)		-0.64** (0.27)		-1.02**		-0.75 (0.48)
Percent food expenditure/total income	-0.003 (0.007)	.001 (.001)	0.006 (0.010)	0.028* (0.015)	-0.008 (0.013)	0.003 (0.010)
Constant	2.42 (2.51)	0.79 (0.98)	1.98 (2.46)	1.82 (1.56)	3.23 (3.76)	1.18 (1.76)
-2 log likelihood(X^2)	647.51	677.7	380.23	374.74	263.67	267.17
p	.97	.96	.69	.76	.99	.98
Improvement	3.77	6.20	2.07	4.58	3.37	3.69
p	.16	.05	.36	.11	.19	.16
Goodness of fit.	722.08	746.4	397.29	404.59	324.78	318.24
p	.42	.46	.46	.36	.37	.49

** p <.05; Wald F-statistics
* < .05 < p < .10
[d] regression coefficient (SE)

caloric intake deficiency risk were also demonstrated by the models in the two farm size classes. These results are consistent with those from other studies which have also shown weak income-caloric intake relationships (Bouis and Haddad 1992; Bouis, Haddad and Kennedy 1992).

ADULT BODY COMPOSITION DETERMINATION

Model estimation, by stepwise regression techniques, shows similar results for each of the body composition indicators of women (Table 7), but more dissimilar results for men (Table 8). This again may be a reflection of the fact that the Quetelet index is a better predictor of body composition in persons with more fat mass, which is generally more the case among women.

Higher risk of belonging to a calorie-deficient household was associated with lower BMI, fat proportion, and fat and fat-free mass in women, holding age constant (the squared age term was included to account for the broad age range). Greater availability of household labor was positively associated with women's body composition, presumably because of greater possibilities of intra-household labor substitution in different tasks.[7]

High shares of on-farm labor supplied by the household (holding household size constant) was associated with lower fat proportions and fat mass in women. Although the household labor share is not broken down by household members, the presumption is that a significant part

[7] We found that larger households ($\geq$6 members) generally consisted of more adults and school-age children, but not necessarily of more pre-school age children, than smaller households (<6 members).

Table 7--Determinants of body composition in women, Western Highlands of Guatemala. Regression models

Independent variables:	Dependent variables: Body Mass Index	Fat-free Mass	Fat Mass	Fat Proportion
Estimated risk of household caloric adequacy (<80%)	-10.945[a]** (4.721)	-22.642*** (7.128)	-14.578*** (5.202)	-27.873*** (6.732)
Percent on-farm family days/year	NS	NS	-.011*** (.004)	-.022*** (.005)
Total household size	.120** (.054)	.202** (.082)	.159*** (.057)	.132* (.073)
Age	.043*** (.013)	.269** (.120)	.031** (.013)	NS
Age squared	NS	-.003* (.002)	NS	.005* (.002)
Constant	22.16*** (0.89)	34.01*** (2.19)	12.14*** (0.94)	26.37*** (1.14)
R^2 (adjusted)	.036	.046	.054	.081
F	8.54	8.22	9.62	14.26
P < F	.0001	.0001	.0001	.0001

*** p <.01
** p <.05
* <.05 < p <.10
[a] Regression coefficient (SE)

Table 8--Determinants of body composition in men, Western Highlands of Guatemala. Regression models

Independent variables:	Dependent variables: Body Mass Index	Fat-free Mass	Fat Mass	Fat Proportion
Estimated risk of household caloric adequacy (<80%)	NS	-34.515*** (9.193)	-7.076* (3.786)	NS
Percent on-farm family days/year	-.014[a]*** (.003)	-.022*** (.007)	-.010*** (.003)	-.017*** (.005)
Total household size	.126* (.042)	.210** (.098)	.088** (.040)	.126* (.068)
Age	NS	.302** (.101)	.090** (.042)	NS
Age squared	NS	-.004*** (.001)	-.001** (.000)	-.001*** (.000)
Constant	21.64*** (0.37)	47.52*** (2.48)	5.96*** (1.02)	12.30*** (.65)
R^2 (adjusted)	.043	.077	.063	.055
F	13.29	10.10	8.32	11.66
P < F	.0001	.0001	.0001	.0001

*** p <.01
** p <.05
* <.05 < p <.10
[a] Regression coefficient (SE)

was supplied by women, as shown elsewhere (von Braun et al. 1989). Labor-land ratios, and the household share in total on-farm labor, were both high in vegetables and potato production, and lower in wheat production, when compared to maize production. Even though labor-land ratios in maize production were lower among diversified farmers, particularly on larger farms, crop diversification increased household on-farm labor inputs (Immink and Alarcon 1993). Fat-free and fat mass in women increased with age, but at a decreasing rate at the margin in the case of fat-free mass. It should also be noted that the models explain little of the variation found in the body composition parameters.

Men who belonged to households at risk of a deficient caloric intake level had generally lower fat-free and fat mass, a result that was not reflected in the BMI and fat proportion equations (Table 8). High shares of on-farm labor supplied by the household was consistently associated with lower BMI, fat-free mass, fat mass and proportions in men. This is not surprising as men provide a major share of on-farm labor.[8] Total supply of household labor was positively associated with men's body composition, while fat-free mass and fat mass increased with age, but at decreasing rates among older men. Again as before, the models explained little of the variation found in the body composition indicators of men.

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[8] See von Braun et al. 1989; since men often report women's labor input in field activities, there is a possibility of under-reporting of women's participation as men may consider only the field activities that they perform as "work".

Crop diversification involves more on-farm work for household members, because of the higher labor-intensity of the new crops, relative to maize and beans. This is reflected in the total person-days, and in person-days per ha., of household labor (Table 9). The smallest differences existed between maize and wheat farms, and the largest between maize and vegetable farms. The share of total on-farm labor supplied by the household was on average statistically the same on maize and diversified farms, except between larger maize and wheat farms. Diversified farms did generally have no advantage over maize farms in available household labor; household size tended to be larger on farms in the higher farmsize class.

CONCLUSIONS

The main issue addressed here was whether body composition of adult women and men can be expected to improve with crop diversification among smallholder farmers. Improved body composition would suggest reduced risk of suffering from chronic energy deficiency. The study involved a small holder farm population in the Western Highlands of Guatemala.

Although diversified farm households had generally higher per capita incomes than traditional farm households, they did not generally have more adequate daily energy intakes. Additional analysis also suggested that daily energy intakes was not very responsive to higher per capita income, or to food budget shares, even though own-produced foods consumed by the household generally constituted a small proportion of total income in this population.

Table 9--Household on-farm labor inputs and household size, by farmsize class and cropping patterns, Western Highlands, Guatemala

Indicators:	Mean (SD)							
	< 1 ha.				≥ 1 ha.			
	MF	PF	WF	VT	MF	PF	WF	VG
Household Labor:								
Total person-days/year	109[1][2] (91)	639[1] (1,935)	370 (270)	982[2] (1,846)	785[1] (1,249)	1,665[2] (1,973)	1,355[3] (1,452)	3,503[1][2][3] (6,759)
Total person-days/ha./year	323[1] (264)	1,036 2,469)	647[2] (491)	1,972[1][2] 4,429)	227[1][2] (200)	681[1][4] (522)	524[3] (4,881)	1,157 (1,432)
Percent household/total labor	80.1 (29.4)	79.3 (26.4)	75.7 (27.1)	73.3 (28.7)	70.7 (33.1)	65.8 (29.81)	55.7[1] (31.6)	62.6 (33.7)
Number of Persons/Household	5.5 (2.2)	5.7 (2.1)	5.1 (2.0)	6.0 (2.0)	6.7 (2.4)	6.4 (2.4)	7.0 (2.3)	7.2 (2.5)

[1][2][3][4] $p < .05$; Scheffe Multiple Range Test

These results are consistent with those reported elsewhere for other rural populations in the developing world. The estimated risk of belonging to a calorie-deficient household was associated with lower body composition: fat-free mass and fat mass in women, and fat-free mass in men.

On balance then, it appears that on smaller farms, any income increases associated with crop diversification are likely to have a small effect on reducing risk of deficient calorie intakes, which may be offset by increased daily energy expenditure in turn due to increased on farm employment by men and women, with no net improvement in their body composition, irrespective of the diversified cropping patterns involved.

Policy measures to improve access to land and to promote crop diversification together with investments in the household's human capital stock such as through literacy, are likely to produce positive effects which, however, not necessarily translate into better body composition of adults. On the other hand, policy measures (such as increased access to credit) aimed at increasing households' access to production resources may produce positive body composition effects if this results in a lower share of on-farm work undertaken by the households, by employing more non-household labor.

On larger farms, where total household labor inputs are higher in spite of less labor intensive production, only if the percent of total labor supplied by the household can be lowered on diversified farms (as is the case on wheat farms), can improvements in adult body composition be expected. In addition, larger diversified farms were

less likely to be calorie-deficient than smaller diversified farms and maize farms in both farmsize categories. This may account for further body composition (especially in fat-free mass) differences observed between men from larger diversified and maize farms.

Chapter IV.27

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Chapter V.1

EFFECTS OF CREDIT WITH EDUCATION PROGRAM ON WOMEN'S NUTRITIONAL STATUS IN RURAL GHANA

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INTRODUCTION

Women play a key role in agricultural production throughout the developing world. In Ghana, the government estimates that 70% of total labor going into food production is contributed by women (Ministry of Agriculture, 1990). The government has made provision of agricultural services to women a priority. This includes the provision of credit. However credit schemes have historically not done very well reaching women for a variety of reasons including lack of collateral to guarantee a loan.

Despite lack luster results of some of the credit policies implemented in developing countries during the 1980's (Adams and Meyer, 1989) recently there has been a resurgence of interest in credit schemes directed to the poor. Some of these innovative credit approaches are put under the label of "poverty lending". As pointed out by Lassen (1990), poverty lending is distinct from other microenterprise support in the nature of the target group and in the way credit interventions are structured.

In interventions classified as poverty lending, the target group is defined as the poorest of the poor which typically includes households or individuals with no tangible assets. In addition, poverty lending strategies are more than financial intermediaries but

rather provide a capability of credit plus savings as part of program activities (Lassen, 1990). Poverty loans generally involve small loans for very short terms to conduct small scale economic activities.

The Grameen Bank in Bangladesh is probably the best known example of what some would classify as a poverty lending approach. The government of Ghana in conjunction with the Freedom from Hunger Foundation (a U.S. based non-governmental organization) has recently embarked on a program that has been referred to as an example of poverty lending to women. However one big difference between the Ghana program and other predecessor projects is the focus on credit plus nutrition activities simultaneously. A program of credit to women is combined with nutrition education and growth monitoring and growth promotion activities. The credit/nutrition program is carried out at the district level by a District Health Management Team (DHMT) which has representation from both the Ministry of Health and the Ministry of Agriculture. There are multiple objectives for the program including improved household food security and improved nutrition for household members, including in particular, women.

The present chapter derives from a larger study to evaluate the effect of various types of credit schemes in Ghana on overall household welfare. This chapter limits itself to results related to women's nutritional status and effects of increasing household income and household structure.

KINTAMPO CREDIT/NUTRITION PROGRAM

The Ghana project is in the Kintampo District in the middle part of the country. The current women's credit/nutrition project evolved from the earlier Applied Nutrition Program (ANP) sponsored by

the Ministry of Health in conjunction with the Freedom from Hunger Foundation. The Applied Nutrition Program which has been operating since 1987 emphasized growth monitoring and growth promotion in conjunction with some preventive health services like immunizations.

However the government felt that the people in the area served by the Applied Nutrition Program also needed assistance in producing more food and/or generating more income to buy food. The program staff determined that the most effective way to do this was through a combination of credit to women linked to growth monitoring and growth promotion activities.

The program interventions are categorized as credit and education. Credit and education are linked because of what is seen as the reinforcing effects of the two components (Freedom from Hunger Foundation, 1989). It is believed that education will promote more effective use of credit for food production and income generation and the appropriate use of credit to improve nutrition and health (Freedom from Hunger Foundation, 1989). Credit will provide a vehicle for bringing the poorer women in the community together to receive the education. The earlier experience of the program had suggested that providing information alone was not enough to attract regular participation of women.

As the current credit program is structured, women are expected to use the loans to engage in income generating types of activities. A small survey conducted in April, 1991 found that agriculture (35%) and trading (28%) were the two major categories in which the credit was used (MKnelly, 1991).

Women are given small loans (average amount about $120 U.S.) for a period of six months. The actual amount to be given to an individual

women is determined by local community credit cooperatives (CCC) which are formed by combining 5 or 6 women groups. The average size of a CCC in a village is 30 women. Commercial interest rates are charged.

There is a required saving component in the program. Women begin to pay back the loan weekly and to begin savings at the same time. Higher savings allows a women to borrow more money in a subsequent loan cycle.

The Government of Ghana/FFH credit/nutrition project is not the only credit scheme in the district. There are a variety of informal credit mechanisms,the most common of which is called "susus". Susus are rotating savings and credit association in the rural areas of Ghana. Susu money collectors visit markets daily to accept deposits, no matter how small, mainly from market women. A susu collector can handle the accounts of as many as 800 to 1,000 people.

Formal credit from facilities such as local banks also exist. Although as already mentioned, due to collateral constraints, women generally do not have access to this form of credit.

In addition to the local financial institutions another program called Global 2000 has been operating throughout Ghana. This program provides credit for a package of inputs into agriculture including seeds, fertilizer and in some cases labor which is paid back either in cash or in-kind once the maize crop has been harvested. The program started at a modest size of only 20 households and expanded rapidly to 80,000 households. Global 2000 could not accommodate this rapid expansion with the existing infrastructure and as of 1991 it was estimated that 30,000 households are still in the program. The program is however active in the Kintampo District.

Chapter V.5

RESULTS

One present of the various types of credit programs implemented in Ghana is that participation in the program will result in increased income which will, in turn, improve nutritional status. Table 1 presents data on women's nutritional status (as measured by BMI) stratified by income tercile and physiological status. For pregnant, lactating and non-pregnant, non lactating women there is not a linear relationship between increasing income and BMI. Table 2 shows a similar relationship using mid-upper arm circumference (MUAC).

Table 3 data categorize women into BMI categories above and below 18.5 the level generally considered an indicator of moderate and severe malnutrition in women. For non-pregnant, non lactating women the proportion of the sample falling below 18.5 decreases with increasing household income. The relationship of income to illness in women, however, is less clear cut (Table 4). For the largest group of women, the non pregnant, non lactating sample, the length of time ill increases with increases income. The same relationship is seen for lactating women. These data need to be interpreted with caution. Rather than indicating that higher income is associated with higher illness, it is equally plausible that if higher income is associated with better educated women, then these women are more thorough in reporting symptoms of illness. Further analyses are exploring this theory.

Table 5 present data on women's nutritional status stratified by

Table 1--Selected indicators of women 15-59 years by physiological status and expenditure per capita tercile (1=lowest), Kintampo, Ghana 1992

BMI	Pregnant		Lactating		Not pregnant/ lactating		All	
	Mean	N	Mean	N	Mean	N	Mean	N
1	22.90	10	20.92	53	21.08	118	21.13	181
2	22.56	11	21.69	42	21.32	98	21.51	151
3	22.06	18	21.86	33	21.05	92	21.37	143
TOTAL	22.41	39	21.41	128	21.15	308	21.32	475

Table 2--Selected indicators of women 15-59 years by physiological status and expenditure per capita tercile (1=lowest), Kintampo, Ghana 1992

MUAC	Pregnant		Lactating		Not pregnant/ lactating		All	
	Mean	N	Mean	N	Mean	N	Mean	N
1	26.09	10	26.43	52	26.49	112	26.45	174
2	26.02	11	26.25	42	26.95	92	26.68	145
3	24.91	18	26.48	33	26.44	85	26.25	136
TOTAL	25.52	39	26.39	127	26.62	289	26.46	455

Table 3--Selected indicators of women 15-59 years by physiological status and expenditure per capita tercile (1=lowest), Kintampo, Ghana 1992

Distribution of BMI	Pregnant		Lactating		Not pregnant/ lactating		All	
	LT 18.5	GE 18.5	LT 18.5	GE 18.5	LT 18.5	GE 18.5	LT 18.5	GE 18.5
	Percentage							
1	.0	100.0	13.2	86.8	16.1	83.9	14.4	85.6
2	.0	100.0	9.5	90.5	13.3	86.7	11.3	88.7
3	5.6	94.4	18.2	81.8	12.0	88.0	12.6	87.4
TOTAL	2.6	97.4	13.3	86.7	14.0	86.0	12.8	87.2

Table 4--Selected indicators of women 15-45 years by physiological status and expenditure per capita tercile (1=lowest), Kintampo, Ghana 1992

Percent time ill	Pregnant		Lactating		Not pregnant/ lactating		All	
	Mean	N	Mean	N	Mean	N	Mean	N
1	7.14	6	7.47	44	13.64	44	10.01	97
2	.00	9	10.36	40	20.15	39	12.90	93
3	9.52	12	17.05	31	22.71	39	17.77	86
TOTAL	5.82	27	11.06	115	18.62	122	13.41	276

Table 5--Selected indicators of women 15-59 years by physiological status and gender of head of household, Kintampo, Ghana 1992

BMI	Pregnant		Lactating		Not pregnant/ lactating		All	
	Mean	N	Mean	N	Mean	N	Mean	N
Gender of head of household								
Male	22.50	38	21.40	123	21.22	257	21.39	418
Female	22.04	3	21.48	7	21.21	59	21.28	69
TOTAL	22.47	41	21.40	130	21.22	316	21.37	487

the gender of head of household. There are no significant differences, on average, in the average BMI of women from male versus female headed household. However, as shown in Table 6, women in female headed households have a lower total time ill when compared to women from male headed households; this finding is seen in women of different physiological status groups. In addition, women in female headed households have fewer women falling below 18.5 when compared to women from male headed households (Table 7). Here again, this is found in each physiological status group.

A part of the explanation as to the apparent effect of gender of head of household on women's BMI is shown in Table 8. The major portion of women time is devoted first to home production activities and secondly to agriculture related activities; this later category includes both crop production and livestock activities. The pattern of time allocation of women varies little across income groups. However, in female headed households women devoted significantly less time to home production and less time to agriculture, although not significantly less. It appears that women in female headed household have less energy intensive time allocation patterns and this works to the benefit of women's nutritional status.

Models for women's nutritional status (BMI) are presented in Table 9. Household income has a marginally significant ($p < 0.08$) positive effect on female BMI. Pregnancy has a positive, significant effect on increasing women's BMI. Participation in the credit with education does not exhibit a significant association with women's BMI. Two other variables have a significant, negative effect on women's nutrition. As the number of hours devoted to home production increases, women's BMI declines significantly. Similarly,

Table 6--Selected indicators of women 15-45 years by physiological status and gender of head of household, Kintampo, Ghana 1992

Percent time ill	Pregnant		Lactating		Not pregnant/ lactating		All	
	Mean	N	Mean	N	Mean	N	Mean	N
Gender of head of household								
Male	9.89	26	11.66	109	18.35	109	13.95	253
Female	.00	3	.00	7	15.97	17	9.05	30
TOTAL	8.87	29	10.96	116	18.03	126	13.43	283

Table 7-Distribution of BMI, weight and height and incidence of illness, women 15-59 years by physiological status, and age group, Kintampo, Ghana 1992

	BMI		Weight		Height		MUAC	Sick last week		N	
	LT 18.5	GE 18.5	LT 45kg	GE 45kg	LT 145 cm	GE 145cm	LT 22.5cm GE 22.5cm	No	Yes		
						Percentage					
Pregnant											
Male	2.6	97.4	5.3	94.7	.0	100.0	13.2	86.8	80.8	19.2	38
Female	.0	100.0	.0	100.0	.0	100.0	.0	100.0	100.0	.0	3
All	2.4	97.6	4.9	95.1	.0	100.0	12.2	87.8	82.8	17.2	41
Lactating											
Male	13.8	86.2	12.2	87.8	1.6	98.4	5.7	94.3	78.0	22.0	123
Female	.0	100.0	.0	100.0	.0	100.0	.0	100.0	100.0	.0	7
All	13.1	86.9	11.5	88.5	1.5	98.5	5.4	94.6	79.3	20.7	130
Not pregnant/ lactating											
Male	14.0	86.0	13.6	86.4	1.9	98.1	4.6	95.4	73.4	26.6	257
Female	11.9	88.1	16.9	83.1	10.2	89.8	8.9	91.1	70.6	29.4	59
All	13.6	86.4	14.2	85.8	3.5	96.5	5.4	94.6	73.0	27.0	316
All											
Male	12.9	87.1	12.4	87.6	1.7	98.3	5.7	94.3	77.1	22.9	418
Female	10.1	89.9	14.5	85.5	8.7	91.3	7.6	92.4	83.3	16.7	69
All	12.5	87.5	12.7	87.3		100.0	6.0	94.0	77.7	22.3	487

Table 8--Time allocation of women 15-59 years by tercile of expenditure per capita (1-lowest) and gender of head of household, Kintampo, Ghana 1992

	Expenditure/cap tercile			Gender of head	
	1	2	3	Male	Female
Housework	4.34	4.34	4.28	4.47	3.37
Personal time	1.02	1.15	1.68	1.20	1.98
Direct child care	.43	.48	.70	.54	.52
Agri-related activities	3.38	2.53	1.98	2.62	2.46
Employment/Manufacturing/Trading	1.61	1.61	1.64	1.63	1.51
Non-household activities	.70	.63	1.14	.77	1.22
Leisure	1.98	1.89	1.83	1.86	2.16
Sleeping	8.08	8.42	8.74	8.37	8.79
Unaccounted	2.47	2.95	2.01	2.55	1.98
N	91	91	96	249	34

Table 9--Model for women's BMI

	B	T	Sig.T
Pregnant	1.026	1.818	.070
Hours/day on household work	-.168	-2.020	.044
Global 2000	-1.256	-2.233	.026
Credit with education	-.376	-.545	.587
Age in years	.016	.742	.459
Expenditure per capita	4.773E-06	1.711	.088
Female-headed household	-.212	-.367	.714
Number of own preschoolers	.040	.182	.856
(Constant)	21.613	21.172	.0000
F	2.099		
Significant F	.036		
R^2	.06		

participation of the household in the Global 2000 program has a significant effect on women's nutritional status. This is in part mediated by the increased demand for women's labor into agriculture.

Finally, Table 10 presents the results of a probit analysis examining the factors that influence the probability of a woman having a BMI less than 18.5; household income does not have a significant effect on decreasing moderate and severe malnutrition in women. However, participation of the household in the global 2000 program again increases the probability that the woman's BMI will fall below 18.5. Here again, this appears to be related to the additional labor demands into agriculture resulting from the household's participation in the Global 2000 program. Further analysis into this issue is warranted.

CONCLUSIONS AND SUMMARY

The linkages between specific public policies and women's nutritional status are complex. This complexity is illustrated in the data from the present study. While increasing income has a weakly significant effect in improving women's BMI, other factors counteract some of this positive effect. As shown from the data, the time allocation patterns for women vary little across income groups. At all levels of income women are involved in energy intensive activities related to home production and agriculture. The amount to time devoted to home production activities has a negative impact on women's nutritional status. In addition, the in-kind credit program, Global 2000 exhibits a significant negative influence on women's nutritional status. The data suggest that policies which increases income in combination with strategies to decrease the time burdens of women

Table 10--Probit equation for women's BMI less than 18.5

	Coefficient	T-ratio	Probit
One	-1.123	-1.715	.086
Expenditure per capita	-.363E-05	-1.399	.162
Global 2000	.861	2.952	.003
Credit with education	-.304	-.620	.535
Age in years	-.149E-02	-.106	.915
Female-headed household	-.898E-01	-.227	.821
Number of own preschoolers	.559E-01	.405	1.685
Hours per day of housework	.631E-02	.120	905
Pregnant	-.660	-1.301	.193

would have more of an effect on women's nutritional status than either one alone.

Chapter V.19

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Chapter VI.1

CAN NEGLECT OF WOMEN'S NUTRITION STATUS PUT A BRAKE ON ECONOMIC ADJUSTMENT IN GHANA?

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INTRODUCTION

The Ghanaian case-study described in this chapter asks "can women's nutritional status put a brake on economic adjustment in Ghana?" The chapter reviews what we know and what we do not know about how economic adjustment in Ghana affects, and is affected by, the nutritional status of women.

Economic adjustment is the process whereby a country seeks to remove internal (domestic budget) and external (balance of payments) financial disequilibria in an attempt to provide a stable backdrop against which resource reallocation can take place; markets are liberated, and resources are induced into sectors according to unfettered world and domestic prices. The preceding stabilization policies (the term 'economic adjustment' is usually used to embrace both 'stabilization' and 'structural adjustment') involve large reductions in government expenditures (removal of subsidies, introduction of user fees, reduction in the number of government employees) and expenditure switching out of the non-traded sectors into the export and unprotected import sectors.

The central questions addressed are: can women, given their nutrition status, bear (1) the increased time burdens of demand-side

stabilization policies, and (2) the increased burdens of supply-side policies which require resource mobility?

HISTORICAL PERSPECTIVES

It is clear that unlike many countries grappling with structural adjustment in accordance with a new set of relative prices that are largely the result of some exogenous economic forces, Ghana's economic decline can be traced back to the 1960s. This decline has been one of domestic policy shortcomings exacerbating the effects of external shocks (declining terms of trade and drought).

The most striking policy miscalculation appears to have been the overvaluation of the Ghanaian cedi in the 1970s, by far the highest currency appreciation rate in sub-Saharan Africa (Commander et. al. 1989). This policy combined with the implicit taxes levied on cocoa, the mainstay of foreign exchange earnings, resulted in a drastic decline in agricultural export earnings. In 1982 cocoa farmers were receiving 17% of the 1960/63 price in real terms, Ghana's international market share in cocoa fell from 36% in the mid-1960s to 17% in the early 1980s, and in Ghana's neighboring countries cocoa prices were twice as high as the domestic price resulting in 8-12% of Ghanaian cocoa being marketed outside of Ghana throughout the 1970s (Commander et. al. 1989). The introduction of a fixed exchange rate regime in the mid 1970s made things worse as the domestic money supply was increased to finance the budget deficit, and this led to inflation rates in the region of 80% in the late 1970s and early 1980s. Real per capita national income fell by 30% between 1970 and 1982.

Chapter VI.3

TRACING GENDER PERSPECTIVES

There is little doubt that women have long played a important economic role in West Africa, especially in the production of food and in trading, not to forget non-marketed production activities inside the home. In the 1940s, when a Tikar woman of west Cameroon was asked why women were mourned for four days and men for only three, she replied:

> "A woman is an important thing. A man is a worthless thing indeed, because a woman gives birth to the people of the country. What work can a man do? A woman bears a child, then takes a hoe, goes to the field, and is working there; she feeds the child [with the work] there. A man only buys palm oil. Men only build houses" Bryson (1980).

The literature documenting historical trends in the role of women in west Africa (see Bryson 1980, and Aidoo 1983, for good reviews) emphasizes the gender impacts of colonialization, urbanization, and deforestation.

Colonialization in the early twentieth century did not lead to a reduced role for women in food production, in fact just the opposite. Colonial rule led to male labor moving into new roles, a male bias in education, and the promotion of cash-crop production among males. Urbanization and the development of non-agricultural sectors placed the burden of increasing food production upon women and also provided them with income sources from the sale of food crops. This led to increased female time burdens because production increases are generated mainly from increased labor inputs rather than the increased application of complementary inputs or improvements in technology. From a gender

perspective then, colonialization, urbanization and deforestation have placed differentially heavy burdens on women (need to raise food production, less access to education, heavier time burdens).

GHANA'S ECONOMIC ADJUSTMENT

Ghana's economic adjustment refers to the Ghanaian government's initiation of the Economic Recovery Programmes I (the stabilization phase in 1983-86) and II (the adjustment phase from 1987 onwards) with pronounced support from external donors. The Ghanaian economic experience has been so distinct in the pre-and post-1983 period that most researchers have found it convenient and illuminating to divide their discussion along these lines. The severity of the pre-1983 decline in living standards and output (both total and per capita) has led several writers to characterize stabilization and adjustment as a success simply because it halted the long decline in Ghana's economic fortunes. Indeed, Norton (1988) and Tabatai (1986) argue that the general conditions were so poor during the pre-adjustment period, that apart from the retrenched urban workers, it is difficult to identify, before the fact, any particular group that will suffer heavily as a consequence of adjustment policies.

Nevertheless we can say that for adjustment to succeed, some individuals, dependent on their sectoral location, will have to be able to shift resources from the nontradable sector to the tradable sector, have access to new resources, and be able to bear the costs of change. Are women in Ghana likely to need to switch resources across sectors and bear the burdens of economic stabilization, and will they be able to do

this?

As regards sectoral location, women accounted for 27% of the government work force in Ghana in 1987, with most of these women being below the age of 45. Ghanaian manufacturing employs a solid one-third (i.e. across all age groups) of its labor force from the female ranks. About half of Ghana's primary-occupation agriculturalists are women. Many female-headed households grow traditionally male crops; this undoubtedly has something to do with the way they became female-headed (e.g. widowed), and it is a factor that should not be ignored by Ghanaian agriculture policy-makers. So women are likely to need to move their resources for adjustment to gather and maintain momentum.

In terms of access to resources other than their own labor, education is perhaps the most visible gender-differentiating process in Ghana (Collier and Horsnall 1989). This has serious consequences for female sectoral location and resource mobility. In terms of educational achievement, females part company with males at the ages of 10-14. Another way of looking at role-model formation is through respondent-parent data. Although respondent-parent occupational patterns from Ghana are intriguing, there is little firm evidence for differences in occupational mobility across gender (Mayatech 1991).

Women's land rights are more vague than men's, their use (if not access to) of credit is less than men's, and they receive less help from Government agricultural extension workers than do men. The signs are encouraging for Ghanaian female-headed households improving cocoa production through the rehabilitation of existing trees (Haddad 1991).

Evidence on rights and obligations in terms of decision-making

indicates variation by region in Ghana. In the more northern regions, where both husband and wife are present it is more likely that there will be no exclusively female decision-making activities, except for trading (Mayatech 1991). This implies that intrahousehold mechanisms may not adequately compensate for the lack of direct access to resources and the increased stress felt by women in the household due to the forces of adjustment.

Finally, Haddad's (1991) gender-disaggregated analysis shows that in terms of time burdens, women are consistently worse-off than men. Reported female time loads are 15-25% higher than those of males. Moreover, the main source of the discrepancy is the much heavier commitment of women to household work. The general tendency is for women to spend 20 hours/week in this activity compared to the male contribution of 5 hours/week. Only one third of this discrepancy is compensated for by a reduction in female time spent in employment outside the home, as women work about 27 hours to men's 31 hours for single job holders, and 42 compared to 47 hours for multiple job holders.

In summary, the social welfare impacts of economic adjustment act therefore through changes in the prices of goods, income, time allocation, and employment patterns. With the exception of price changes we have access to sections of the Ghana Living Standards Survey data which can be used to explore the impact of these factors on female nutritional status, and the importance of female nutrition status on nutrition status of preschoolers, and female wage rates.[1]

Chapter VI.7

THE 1987-88 GHANA LIVING STANDARDS SURVEY DATA

The data used in this analysis are from the Ghana Living Standards Survey (GLSS). The data were collected by the Ghana Statistical Service in 1987 and 1988, and constitute a nationally representative sample of 3136 households containing 15071 household members. The data cover all aspects of household income generation and expenditure; outcome measures of living standards (literacy, numeracy, housing, morbidity, anthropometrics, and reproductive histories); and constraints to further improvements in living standards (credit, savings, fuel and water collection, partial time allocation, and decision-making). For a much more detailed description of the data, the reader is referred to Grootaert (1986), Pyatt (1987), and World Bank (1988). The data have been analyzed most generally in Boateng et al. (1990) and Haddad (1991).

THE IMPORTANCE OF WOMEN'S NUTRITIONAL STATUS IN GHANA

If women have heavy time burdens, how does this inhibit their ability to be able to bear the increased time burdens of demand-side stabilization policies and the increased burdens of supply-side policies which require resource mobility? The answer to this question will be conditioned by the nutritional status of adult women in Ghana.

As Table 1 shows, in terms of mean Body Mass Index $(BMI)^2$ and the percent of the group falling below BMI=18.5, Ghanaian men have a lower nutritional status than women. When pregnant and lactating women are excluded from the sample (Table 2), the gap narrows, but men are still worse off. Moreover, moving from lowest to highest household per capita expenditure tercile, male BMI is more responsive than is female BMI to

Table 1. Mean of BMI and percent below 18.5 BMI, urban and rural households in Ghana, by expenditure per capita tercile and gender

Expenditure Tercile	Male				Female				Total			
	N	Mean	Nbelow	Perc	N	Mean	Nbelow	Perc	N	Mean	Nbelow	Perc
Urban & rural												
Body mass index												
Lowest	1456	18.80	687	47.2	1767	20.00	556	31.5	3223	19.46	1243	38.6
Middle	1294	19.38	482	37.2	1472	20.74	388	26.4	2766	20.10	870	31.5
Highest	1052	20 22	272	25.9	929	21.45	206	22.2	1981	20 80	478	24.1
Subtotal	3802	19.39	1441	37.9	4168	20.59	1150	27.6	7970	20.02	2591	32.5

Table 2. Percent below Cut-off of BMI
Urban and rural households in Ghana,
by physiological status and expenditure
per capita tercile

Expenditure Tercile	% < 18.5		% >= 18.5	
	N	Perc	N	Perc
Urban & rural				
Pregnant/lactating				
Lowest	44	10.0	395	90.0
Middle	32	10.2	281	89.8
Highest	12	8.8	125	91.2
Total	88	9.9	801	90.1
Non-preg/non-lact				
Lowest	512	38.6	816	61.4
Middle	356	30.7	803	69.3
Highest	194	24.5	598	75.5
Total	1062	32.4	2217	67.6
All female				
Lowest	556	31.5	1211	68.5
Middle	388	26.4	1084	73.6
Highest	206	22.2	723	77.8
Total	1150	27.6	3018	72.4

income increases. A legitimate question arises at this point: if male BMI is worse than female BMI why are we focussing on the latter?

The main justifications for the focus on female BMI include: (i) relative to men, women's time stress, is likely to be increased disproportionately during the course of economic adjustment because of initially heavier time burdens and their juggling of productive and reproductive roles (Mayatech 1991), and (ii) the functional consequences of low female BMI are likely to be more wide-ranging than those of low male BMI; this is especially so in predominantly matrilineal society such as Ghana.

On the functional consequences of female undernutrition, preliminary regression models in Kennedy, Peters, and Haddad (1992) suggest that while preschooler weight for age and adult female BMI are closely positively wedded, the magnitude of the association seems smallest for female headed households, especially where the preschooler is the child of the head, or the woman is the mother of the preschooler. This raises the question as to whether women are forced to act as so-called 'shock absorbers' in households with high dependency ratios through the liquidation of their own nutritional status. However, a more conventional human capital study on the returns to adult health in Ghana using the GLSS data by Schultz and Tansel (1991) does not find an effect of increased female morbidity on formal sector wage rates earned. The authors caution that "perhaps with only 4 to 7 percent of the samples of women reporting wages, the small working samples limit the power of two stage (regression) methods" to measure the functional consequences of female morbidity.

If a nutrition-education link exists in Ghana the pay-off to improved female nutrition education vis a vis male education is the positive and significant effect on daughters' height and a zero impact on sons' heights. Paternal education on the other hand has a negative impact on both sons' and daughters' heights (Thomas 1991). With the same GLSS data, Glewwe and Jacoby (1992) show similar results: mothers' years of schooling to have a positive effect on the mathematics and reading achievement of children (significant in the former situation, and weakly significant in the latter). On the other hand, fathers' years of schooling does not even approach significance for the child's mathematics or reading achievement.

Finally, relative to the nutritional status of women elsewhere in Africa, Ghanaian women do not fare well. Table 3 shows that women's nutrition status in rural Ghana (GLSS) is worse than that of women in rural Kenya and rural Malawi. For non-pregnant women of typical child-bearing age (15-45 years), approximately 14 percent have a BMI below the 18.5 cutoff, whereas for Kenya and Malawi, the corresponding figures are 6 percent and 11 percent.

DETERMINANTS OF MALE AND FEMALE BMI IN GHANA

Previous Studies

For Ghana, preliminary analyses of GLSS data indicated that increased income does lead to improvement of female nutritional status. Alderman (1990) notes that nutrition status of women is positively influenced by education, and per capita household expenditure. Alderman's modelling implies that the latter impact occurs even when

Table 3: Selected women indicators, by gender of head of household by household per capita expenditures tercile

	Kenya (N = 963)				Malawi (N = 112)					Ghana (N = 1,306)				
	Male	All Female	Female De jure	Female De facto	Male	All female	Female Migrant	Female De jure	Female De facto	Male	All female	Female De jure	Female De jure Married	Female De facto
Body Mass Index (BMI)														
All terciles	22.24	22.72	22 63	22.94	21.03	21.68	22.87*	21.56	21.00	20.91	21.03	20.85	21.13	21.14
Bottom tercile	22.45	22.86	22.47	23 44	20.63	21.02	19.63	22.88*	20.44	20.61	20.84	20.55	20.26	20.40
Middle tercile	22.19	22.36	22.67	21.67	20 76	21 68	24 26*	20.07	21.62	20.89	20.95	21.07	20.78	21.72
Top tercile	22 10	22.91	22.72	23.68	21.63	22.61	23 49	21.16	21.42	21.27	21.36	21.30	21.44	21.19
N of women	794	169	117	52	77	35	10	9	16	947	359	140	187	32
Percent with BMI < 18.5														
All terciles	6.5	5.3	4.3	7.7	10.4	11 4	0 0	22.2	12.5	14.1	14.8	12.9	15.5	18.8
Bottom tercile	4.1	6.5	8.1	4.0	13.6	7.1	0.0	0.0	12.5	16.5	14.3	15.4	11.3	25.0
Middle tercile	7.8	9.6	5.6	18.8	17.2	27.3	0.0	66.7	16.7	13.2	15.5	11.1	17.3	22.2
Top tercile	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	14.4	10.0	16.9	13.3
N of women	52	9	5	4	8	4	0	2	2	134	53	18	29	6

* Significantly different from male-headed households at $p < 0.05$

Source: Kennedy, Peters, and Haddad (1992)

controlling for disease incidence, health expenditures, and food expenditures. Alderman posits a time-activity hypothesis:

> "energy expenditure per unit of time worked decreases with assets which correlate with expenditures per capita. Moreover, if leisure is a normal good, and furthermore, less intensive than work, the effect would be enhanced through the increased demand for leisure" (p.18).

A more direct examination of the BMI-time allocation link tests the above hypothesis by focussing on the *intensity* of women's work, controlling for total expenditure per capita. Higgins and Alderman (1992), using the GLSS data set, indicate that women's increased agricultural labor has a significant negative impact on their nutritional status. Specifically, their regression analysis shows that:

> "an additional ten-hour day per week devoted to agricultural labor would result, ceteris paribus, in an expected reduction in BMI of 0.64 (nearly 15% of the range between obesity and the cutoff for mild chronic energy deficiency)" (p.16).

In addition to time stress, Alderman (1990) notes that nutrition status of women is negatively influenced by parity or reproductive stress. Specifically, he finds that increased parity (number of pregnancies) has a negative and significant effect on adult female body mass index, BMI. He cites this result as support for the controversial 'maternal health depletion syndrome'.

A different type of reproductive stress has already been hinted

at in the regression work of Kennedy, Peters and Haddad (1992) reported above. Specifically, regression estimates of the effect of average preschooler z-score weight for age on female BMI for different headship types and mother status reveal that the relationship between a woman's BMI and the average z-score of preschoolers in her household is least strong when she is the mother of at least one of the preschoolers. This effect is particularly strong for the de facto and male groups.

Regression Analysis

Tables 4 and 5 present regression results for the determinants of adult male and adult female BMI. Household per capita expenditure (instrumented with household assets) has a positive and significant effect on male and female BMI, with the effect being larger for females. This result is in accordance with Alderman (1990). However, the hours worked dummy (1 if in the top tercile of non-leisure hours, 0 if not; instrumented with ???) is insignificant for rural women, significant but positive (at 10 percent) for urban women, insignificant for urban men, and positive and significant for rural men. Higgins and Alderman (1992) found that increased agricultural hours affected female BMI negatively, and that increased nonagricultural hours affected female BMI positively (both significant effects). This result seems to be reflected in the regression results reported here because for urban women hours worked are likely to be in nonagricultural activities. In rural areas, hours worked are more likely to be in agricultural activities, and yet, unlike Higgins and

Alderman (1992), we get an insignificant effect for women. Perhaps Higgins and Alderman's results are dependent on the separation of agricultural hours from total hours, or perhaps on their specification which is similar to ours, but including female height, and excluding the different female headship types.

Women in urban de jure and rural de jure married households are likely to have better BMI's than women in male headed households, although the de facto effect is insignificant. This may reflect an increased control over household resources, especially in the rural de jure married households.[3] In contrast, men in de facto female headed households do better than men in male headed households, but this may reflect a self selection in that healthier males are more likely to be absent for long periods of time in order to remit back to the de facto household.

Urban women have better BMI's than rural women, but for men there is no significant effect. This may reflect the more arduous nature of the tasks performed in rural areas, or the result may be due to lack of wealth effects that are not captured in the total expenditure variable. Predictably, pregnant women have a higher BMI that non-pregnant women, and older women have higher BMI's, although the negative coefficient on the squared age term indicates that BMI's begin to level off for the older women and older men.

Per capita landownership is negatively and significantly associated with BMI of men and women in rural areas, but not in urban areas. This again probably reflects the arduous nature of non-leisure activities for land-holding rural families in labor-scarce

environments. This is another plausible reason that the dummy variable on hours worked is not significant for rural women.

The percent of preschoolers in a household has a negative and significant effect on male and female BMI in rural, but not urban areas. Again, this could be interpreted as time stress on women in rural areas where labor is scarce and opportunity costs are high. On this point it is noteworthy that the number of female adults in the household improves female (but not male) BMI in rural (but not urban) areas, consistent with a relaxation of the time constraint where women can share responsibilities and activities.

DISCUSSION AND CONCLUSIONS

The social welfare impacts of economic adjustment act through changes in the prices of goods, income, time allocation, and employment patterns. Women in Ghana have heavier time burdens, less access to resources, and yet successful adjustment will probably require that they bear extra burdens and respond to new economic opportunities. Women's nutrition status could be a serious brake on the success of adjustment policies. This is because (i) lowered income and increased time stress lowers women's nutrition status (although the creation of de facto female headed households--due, for example, to male migration to newly productive sectors under a new set of adjustment prices--does not seem to be associated with significantly poorer nutritional status) and, (ii) neglect of women's nutritional status has functional consequences that are more wide-ranging than is the case for men--particularly with respect to the

Table 4: BMI Determinants: Females > 14 years of age.
Two stage least squares estimates, Ghana.

Variable	all		rural		urban	
	beta	t	beta	t	beta	t
DHRWK	5.4733	1.922	-0.2325	-0.116	4.3469	1.830
LNTE	2.9557	4.675	3.2465	5.650	3.4340	4.275
AGEYC	0.0272	0.258	0.1917	2.945	0.1086	0.911
SQAGE	-0.0001	-0.103	-0.0022	-2.721	-0.0010	-0.733
HHSIZE	0.1229	1.594	0.0875	1.208	0.2696	1.904
NCH	0.0162	0.181	0.0130	0.149	0.0806	0.480
NFADLT	0.2704	2.112	0.1909	1.694	0.2505	1.075
PCTPSCH	0.00002	0.004	-0.0090	-2.938	0.0079	1.663
LANDOWPC	-0.0209	-3.122	-0.0150	-2.611	-0.0372	-1.073
DREAD	0.0948	0.462	0.1120	0.606	-0.2130	-0.687
DF	-0.5543	-1.083	0.0582	0.117	-1.2992	-1.508
DJ	0.9161	3.304	0.3921	1.497	1.1205	2.585
DJM	0.7397	2.866	0.6103	2.632	0.5268	1.288
DURBAN	0.7929	2.949		-		
DFOREST	-0.4874	-1.627	-0.0112	-0.057	-0.6775	-1.563
DSAVANNA	-0.4269	-1.371	-0.0152	-0.062	-0.4968	-0.944
DPREG	1.0568	3.298	1.0770	3.616	1.6514	2.755
Constant	-16.2900	-2.387	-17.9419	-2.882	-22.5647	-2.467
Adjusted R2	0.0889		0.0779		0.1010	
F-test	21.020		13.179		9.310	
N	3481		2307		1184	

Table 5: BMI Determinants: Males > 14 years of age.
Two stage least squares estimates, Ghana.

Variable	all		rural		urban	
	beta	t	beta	t	beta	t
DHRWK	1.6838	1.411	1.9413	2.085	0.6844	0.275
LNTE	1.7245	4.059	1.7729	3.479	1.3788	2.699
AGEYC	0.1884	3.946	0.1380	3.953	0.3376	2.691
SQAGE	-0.0018	-3.405	-0.0013	-3.192	-0.0034	-2.591
HHSIZE	0.2193	4.873	0.1695	3.259	0.2748	3.180
NCH	-0.2120	-3.889	-0.2077	-3.231	-0.1179	-1.128
NFADLT	-0.0431	-0.568	-0.0412	-0.458	-0.0381	-0.236
PCTPSCH	-0.0062	-3.223	-0.0085	-3.541	0.0002	0.045
LANDOWPC	-0.0097	-2.508	-0.0098	-2.247	-0.0128	-0.550
DREAD	0.4680	3.554	0.5485	3.754	0.5313	2.183
DF	0.4919	1.315	0.9409	2.308	-0.4568	-0.665
DJ	0.4825	2.207	0.4822	1.756	0.5091	1.390
DJM	0.1683	0.747	-0.0928	-0.333	0.4806	1.256
DURBAN	0.2870	1.745				
DFOREST	0.2337	1.459	0.0810	0.427	0.3701	1.383
DSAVANNA	0.5974	3.117	0.5997	2.581	0.3261	0.885
Constant	-4.2319	-0.921	-3.5153	-0.645	-3.3435	-0.566
Adjusted R2	0.2066		0.1434		0.3073	
F-test	46.48		21.56		29.15	
N	2796		1843		953	

nutritional status of their children. Poor female nutrition status leads to poor nutrition status of preschoolers; good female nutritional status buffers preschoolers from exogenous shocks intrinsic to the adjustment process.

In summary, although (i) male nutritional status is lower than female nutritional status and (ii) female and male nutritional status is susceptible to income losses and time stresses than may be associated with adjustment, we infer that it is particularly important to monitor female nutrition status if adjustment is not to be undermined. Unlike men, poor nutrition status will impair the ability of the household to shield preschoolers from the abrupt price changes and loss of services that which may accompany adjustment.

Chapter VI.20

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Chapter VI.23

ENDNOTES

1. This is not as serious an omission as it may seem. While the nominal prices in Ghana have risen post-adjustment, reflecting general inflation, the price of food relative to non-food has actually fallen (Sahn 1990). Moreover, in Ghana, because the food basket of the majority of poor Ghanaian households is largely filled with non-traded staples. Indeed, 65 percent of the working age population in Ghana is involved in non-beverage agriculture (Mayatech 1991).

2. BMI is weight divided by squared height, kg/m^2

3. De jure female-headed households are those in which a woman is generally considered the legal and customary head of household. In Ghana, 57 percent of self-declared female heads are married. Nine out of ten of these married self declared female headed households live without a cohabiting husband. This 57 percent has been split out as a separate married de jure group. In Ghana, de jure households are headed by women who are divorced, separated, and unmarried. Typically, in de jure households, the female head of household is thought to have control over most household income and assets. De facto female-headed households are those where the self-declared male head is absent for at least 50 percent of the time.

Chapter VII.1

EFFECTS OF PRICE AND INCOME FLUCTUATIONS ON WOMEN'S NUTRITION AS MEASURED BY INDIVIDUAL NUTRIENT INTAKES IN RURAL PHILIPPINES

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INTRODUCTION

One of the key aspects in the analysis of effects of policies and programs on the nutrition of women is the individual consumption responses of women to changes in the economic environment--specifically on changes in incomes and prices particularly of food. Nearly all of the consumption parameters that have been reported in the literature have been measured at the household level. Household per capita measures are simply proxy indicators for each individual member's consumption behavior; the assumption is that resources are evenely allocated to members based on need.

The point of departure of this paper is that individual responses of women members of the household to changes in prices and incomes maybe different from those estimated by the usual household level parameters. This apriori is based on the widely accepted role of women who have the main responsibility for welfare provisioning in the household----that in situations of scarcity, that women generally would care for the needs of other members ahead of her own needs (Canteras 1985). Recent interest in intra-household allocation issues have raised the possibility that

members of the household may have uneven access to resources--leading to lower welfare among the disadvantaged members (Senauer, Garcia and Jacinto 1988, Haddad and Kanbur 1990).

The practical importance of estimating the levels of price and income responses of households is widely acknowledged (Bouis 1992). Policymakers generally want information on what the effects of alternative policy options are on the consumption particularly of the poor. The household is seen as the intermediary between the policies and their impact on individuals that comprise the household. This paper explores the issue of whether consumption of the individual female members adjust their own consumption in the face of adversity (such as declining incomes or increasing prices) in favor of children or in favor of other members of the family. Does household adequacy in food for example, also imply individual female adequacy?

DATA

In order to assess the differences in consumption patterns for members of the family, data on individual food intakes are used. The data were collected as part of a subsidy project in the Philippines (Garcia and Pinstrup-Andersen 1987). A total of 840 households were surveyed and data collected include household and individual member information on income and expenditures, food expenditures, food consumption, demography and anthropometry. It also covered community variables such as sanitation, infrastructure and community programs. In that survey, two methods of collecting food consumption were used--one using a 24-hour food consumption weighing method for the household and

another using individual food weighing methods for each family member. This allows us to compare results using household as against individual women measures.

There are a few important points to note about the individual dietary methods. This procedure is quite complex and for this reason the dietary surveys for individuals were done only for a sub-sample of 140 out of the 840 households. Although professional nutritionists were involved in the collection of the data, individual weighing of food during meals maybe disruptive and thus are prone to errors. Problems of the individual dietary methods have been noted in Harriss (1992) in surveys in India. The surveys were done on four different visits in a span of 16 months, thus the analysis use repeated observations.

The samples were drawn randomly from three relatively poor areas in the provinces of Abra, Antique and Cobatato. Annual incomes were estimated at $250 per capita, which is much lower than the national average of $630 per capita at the time of the survey. In these households, the share of food in the household budget is around 67%--indicating very low resources. Household size was about 6.7 which was roughly the average of the country, although the dependency ratio was high with 33% of the family members below 6 years of age.

Empirical Results

Around 142 individual food groups were collected in the dietary surveys. These were translated into their nutrient equivalents (calories, protein, vitamin A and iron) using Philippine food composition tables. Table 1 presents the results for these nutrients for adult male and female members above 15 years of age. For purposes

Table 1—Micronutrient Intake: Women Versus Men
(15 Years Old and Above)

	INTAKE PER DAY			
	Calories	Protein	Iron	Vitamin A
	Calories	Grams	Mg	Mcg
Females				
Pregnant	1,525	46	10	164
Non-pregnant	1,576	49	10	200
All female	1,572	49	10	197
Male	1,928	60	12	272
Household per capita	1,738	54	11	231

of comparison, the table includes results using household per capita measures, while the first four lines are results using individual intakes. It is very clear that using household averages hide considerably the distribution of food within the household. The mean intake of the male adults is about 1928 kcals per day compared to around 1572 for the females. The disparity is even more pronounced with respect to protein and vitamin A.

The differences among males and females are however, more meaningful when analyzed in the context of nutrient requirements based on body size/and physiological state and activity levels. These are given in Table 2, broken down into three age groups. The adequacy ratios (given in percent) are derived by dividing the individual's nutrient intake by his or her recommended daily allowance (RDA) for that nutrient. For calories, two estimates are given: one where intakes are not adjusted for activity and a second where requirements are adjusted for physical activity.

The results in Table 2 indicate that the differences between males and female adequacy in calorie intake are not significant for adults, but are slightly different for preschoolers and adolescents. After adjusting for activity however, the adequacy of adults were much lower--which is not surprising given the amount of physical work engaged by adults in rural agricultural setting. The point, nonetheless, is that with respect to calories there seems to be no differences in adequacy in adult male and females. The differences between adult and child adequacy ratios for calories also diminishes after adjustment for activity.

Table 2—Nutrient Adequacy Ratios: Females Versus Males

	PERCENT ADEQUACY					
	2-6 Years		7-15 Years		16-60 Years	
	Females	Males	Females	Males	Females	Males
Calories	58	65	61	66	76	78
Adjusted Calories*	61	68	60	67	58	57
Protein	94	107	86	101	81	96
Iron	85	94	72	99	62	122
Vitamin A	96	96	73	83	82	92

* Adjusted for activity.

The results of the analysis of the other nutrients gave observations which are different from those of calories. There are significant differences in the intake of protein, iron and vitamin A across gender for virtually all age groups. The most uneven distribution is that of iron intakes particularly for adults where the adequacy of females are almost half those of males who appear to consume 22 percent above their requirements (or 122% adequacy). If insufficient iron is consumed, iron deficiency anaemia results--a condition whereby the haemoglobin concentration in blood falls. The problem is especially acute in women of childbearing age. The results in Table 2 also point to large deficits in iron for teenage girls. The lower adequacy levels are also noted for protein and vitamin A.

The main conclusion from these descriptive tables is that using the household level data on consumption of food would be misleading when used to describe the problems of women within these households. Thus, if women are specific targets for some programs, household level indicators may be poor proxies.

WOMEN LEVEL CONSUMPTION OF NUTRIENTS: EXPLORING SOME DETERMINANTS

The method for estimating the consumption parameters for individuals is an extension of that used for households. It incorporates certain notions of intrahousehold allocation of food which are affected by individual, household and community characteristics. Individuals face the same prices that households face. However, certain individual characteristics may influence food consumption of individuals within the households. For instance, women members especially mothers

may adjust their own intake in favor of their children; or male members may partake of a larger share because of higher energy requirements.

An econometric model to estimate consumption behavior has been used in analyzing the individual consumption of women. The variables included in the model are given in the equations in Table 3. Four separate equations are estimated, for each of the four nutrients. The estimating equation uses wage rates of women as well as men. Prices of the main food items that go into the diet have also been included in the equations. Wage rates were predicted since not all women in the samples are in the labor force. There are other individual characteristics of women included in the right hand side which are posited to affect individual consumption: age and age squared, and their own educational attainment. Their physiological state are also important determinants in this case because they affect requirements, for example at various stages of pregnancy. Some household characteristics that could affect nutrient intakes are included in the model. These include demographic characteristics including household size, household composition (percent adults and percent children).

In order to assess how household levels of nutrient intakes affect individual women's intake, the total household nutrient intake expressed in per capita terms is also included as an explanatory variable.

The results from the individual nutrient intake regressions are given in Table 3. These are estimated for women's groups with age from 15-59 years of age. Increases in wage rates in women increases her own consumption of calories, but not when men's wage rates rises. This positive and significant relationship maybe related to her increased

TABLE 3

NUTRIENT REGRESSIONS: INDIVIDUAL INTAKE, WOMEN 15-59 YEARS

	LOG CALORIES (kcals/day)	LOG PROTEIN (grams/day)	LOG IRON (mg./day)	LOG VIT. A (RE/day)
Intercept	6.322 (22.2)**	2.574 (7.44)**	1.448 (2.82)**	3.316 (5.15)**
Log. predicted wage, male	0.008 (0.13)	-0.045 (-0.61)	0.027 (0.24)	0.230 (1.56)*
Log. predicted wage, female	0.127 (1.68)*	0.214 (2.29)**	0.236 (1.65)*	0.158 (0.86)
Age in years	0.023 (2.62)**	0.043 (3.46)**	0.024 (1.26)	0.048 (2.04)**
Age, squared	-0.003 (-2.23)**	-0.005 (-3.35)**	-0.0003 (-1.34)	-0.0006 (-1.81)*
Education, years	0.002 (0.47)	0.001 (0.31)	0.005 (0.61)	0.014 (1.27)
Household size	0.014 (0.58)	0.058 (-1.91)**	-0.024 (-0.51)	-0.104 (-1.64)*
Percent pre-schoolers	-0.015 (-0.71)	-0.066 (-2.44)**	-0.002 (-0.05)	-0.091 (-1.67)*
Percent female adults	-0.160 (-3.18)**	-0.159 (-2.56)**	-0.078 (-1.44)	-0.066 (-0.53)
Household calorie per capita	0.0003 (7.83)**	-	-	-
Household protein per capita	-	0.012 (7.48)**	-	-
Household iron per capita	-	-	0.044 (5.83)**	-
Household vitamin A per capita	-	-	-	0.002 (8.14)**
Pregnant, 1=1st trimester	-0.246 (-1.62)*	-0.547 (-2.96)**	-0.655 (-2.87)**	0.032 (0.96)
Pregnant, 1=2nd/3rd trimester	0.053 (0.89)	0.080 (1.09)	0.109 (0.97)	0.091 (0.67)
Lactacting, 1=yes	0.145 (3.71)**	0.158 (3.25)**	0.099 (1.35)	0.137 (1.49)
Log price, rice	-0.072 (-2.46)**	-0.027 (-1.74)*	-0.057 (-1.61)*	-0.035 (-0.96)
Log price, corn	-0.002 (-0.18)	-0.008 (-0.53)	-0.009 (0.58)	-0.013 (-0.46)
Log price, bread	-0.023 (-0.64)	-0.015 (-0.35)	-0.027 (-0.37)	-0.104 (-1.24)
Log price, sweet potato	-0.004 (-0.21)	-0.007 (0.28)	-0.041 (-1.50)	-0.074 (-0.68)
Log price, fish	-0.021 (-0.51)	-0.025 (-0.49)	-0.026 (-1.07)	-0.095 (-1.00)
Log price, beef	-0.020 (-0.68)	-0.028 (-0.74)	-0.003 (-0.04)	-0.013 (-0.27)
Log price, green, leafy vegetables	-0.052 (-3.04)**	-0.073 (-3.46)**	-0.070 (-2.00)**	-0.083 (-2.01)**
Log price, fruits	-0.046 (-2.43)**	-0.064 (-2.77)**	-0.110 (-2.16)**	-0.126 (-2.87)**
Log price, eggs	-0.028 (-0.73)	-0.008 (-0.18)	-0.041 (-0.21)	-0.022 (-0.24)
	-	-	-	-
N	461	461	461	461
F Value	6.51	7.20	3.34	5.90
R-squared	0.38	0.41	0.24	0.40

* Significant at 0.10

** Significant at 0.01

requirements due to higher levels of activity. It is also clear that female calorie intake is not affected by the wage rates of men in the family, although it increases in general with increasing supply of calories in the household. Surprisingly, her own education does not affect calorie intakes. Consumption is influenced more by her age but declines at higher age (square of age) which is in line with the biological food requirements which increases then declines in older people. One surprising result is that women who are pregnant in the first trimester consume less calories, and consumes more when lactating.

In this sample, the main cereals (rice and corn) supply most of the calories in the diet. The response of individual calorie intakes to changes in the price of rice is significant and in the expected negative sign--that is increases in the price of rice result in lower caloric intake.

Individual protein intake is likewise affected significantly by the factors that influence calorie intakes. In contrast, individual demand for calories and protein are essentially different from the demand for micronutrientst such as iron and vitamin A. While consumers are aware of the fluctuations in calorie content of their diet and in general make adjustments to maintain adequate levels of calorie consumption with fluctuations in prices, such awareness is not the case for iron or vitamin A. In general consumers react to increases in the price of staples by reducing their intake of non-staples or non-food items to protect acceptable levels of consumption of calories.

Individual intakes of iron by women are affected by her wage rates. Worth noting is the result for women who are pregnant in the

first trimester which indicate lower iron intakes at the time when iron requirements for pregnancy are increased. Deficiency in iron especially among pregnant women is one of the main causes of anaemia.

In contrast to calories, protein and iron, intakes of vitamin A is not afffected by her own wage rate. The sources of vitamin A are also relatively concentrated in very few foods--mainly vegetables and fruits. In general consumers are not conscious of the amounts of vitamin A consumed. The results indicates that as prices of green vegetables and of fruits increases, consumption of vitamin A declines.

HOUSEHOLD LEVEL VS. WOMEN LEVEL CONSUMPTION PARAMETERS

In order to compare consumption parameters between household and individual level data, separate regressions were estimated: first using household per capita and then using individidual women level for all the four nutrients. The results are shown in Table 4. The price elasticities here should not be confused with individual commodity own- own- or cross-price elasticities. The results are price and income elasticities indicated for nutrients aggregated from all food sources. The women level elasticities were calculated from the model in Table 3, while the household level results were estimated from regressions that use household per capita nutrients (not shown here).

The results are somewhat surprising. The calorie-income elasticity of 0.30 at the household level is generally in line with those observed in the literature. This compares to about 0.03 when using individual women level data. The large differences in the other micronutrients are also observed: .06 vs. 0.2 for protein, .25 vs. .08

TABLE 4

NUTRIENT PRICE AND INCOME ELASTICITIES: HOUSEHOLD VS. WOMEN LEVEL ESTIMATES*

PRICE ELASTICITIES	CALORIES		PROTEIN		IRON		RETINOL	
	Household Per Capita	Women Level	Household Per Capita	Women Level	Household Per Capita	Women Level	Household Per Capita	Women Level
Rice	-0.150	-0.070	-0.160	-0.030	-0.140	-0.050	-0.090	-0.04
Corn	-0.001	-0.002	-0.030	-0.008	-0.020	-0.009	-0.020	-0.01
Bread	-0.100	-0.020	-0.010	-0.015	-0.040	-0.027	-0.080	-0.10
Sweet Potato	-0.006	-0.004	-0.080	-0.007	-0.070	-0.040	-0.100	-0.03
Fish	-0.100	-0.020	-0.050	-0.020	-0.100	-0.020	-0.210	-0.09
Beef	-0.040	-0.020	-0.030	-0.030	-0.180	-0.003	-0.150	-0.01
Green Vegetable	-0.003	-0.050	-0.010	-0.070	-0.002	-0.070	-0.020	-0.08
Fruit (banana)	-0.009	-0.040	-0.040	-0.060	-0.005	-0.110	-0.040	-0.12
Egg	-0.040	-0.020	-0.030	-0.008	-0.020	-0.040	-0.003	-0.02
Income Elasticity	0.300	0.03	0.06	0.02	0.25	-0.06	0.04	0.01

* Estimates at the mean

for iron and .04 vs. .01 for vitamin A. The main conclusion from these results imply that individual consumption of women are not as responsive to changes in household incomes. It appears that women maintain the same levels of intake with fluctuations in incomes. Recall however, that the average adequacy level of females (Table 2) particularly for iron are extremely low in comparison to other members of the household particularly in comparison to men.

The same trends can be concluded from estimates of the price elasticities. In general, price elasticities estimated for individual women are lower than those estimated using household level consumption.

DISCUSSION AND CONCLUSIONS

Individual nutrient intakes of women have been shown to be very low in relation to their requirements for adequate health and well being. There are no differences in calorie adequacy between males and female adults when requirements are adjusted form activity. However, exceptional disparity with respect to adequacy in protein, iron and vitamin A are noted between male and female members of the household. In these households, men consume than 100% or their own requirements for iron, whereas adult women are only 62% adequate. Thus, a reallocation of food within these households could potentially improve the nutritional status of the female members. These results are indicate that household measures are not adequate to describe the problems of female members of the household.

Changes in household incomes and prices appear to have less impact on individual women's consumption of nutrients. Calorie-income

elasticity in household per capita terms is about .30 compared to .03 when estimated at the individual level. It must be borne in mind that income here is measured at the household level. The results using women's wage rates show that women's calorie intakes would rise with increasing wage rates--probably reflecting increasing requirements when women's work outside the home increase.

Changes in prices also have minimal effects on individual women intakes. Women in this setting are consuming lesser amounts than other family members, and they do not seem to adjust consumption to increasing incomes or prices. They do however adjust their intakes when they work outside the home, presumably in response to increase in requirements for energy to carry their work.

Chapter VII.I5

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VIII.1

DETERMINANTS OF NUTRITIONAL STATUS OF WOMEN IN RURAL PAKISTAN

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INTRODUCTION

Like other South Asian countries, the health and well-being of Pakistani women is very poor. The survival rates of females in Pakistan are much lower than that of males. This is reflected in the very low female to male ratio of 0.91. Maternal mortality rates are estimated at around 600 per 1,000 live births, a figure that is extremely high (WHO 1991). By comparison, the rates in West Europe is less than 10 per 100,000; in Guatemala, around 92 per 100,000.

A number of studies have argued that the large disparity in survival of females in Pakistan are due to the lower social status of women. These are seen in the relative neglect of girls in feeding and health care (Sathar 1987, Alderman and Gertler 1992), because of an unconscious preference for sons in that society.

Much of the poor health of women in Pakistan have nutritional antecedents. The National Nutrition Survey of 1987 found that the caloric and protein deficiency among pregnant and lactating women in Pakistan are very high; 45% were anemic which are due largely to deficiency in iron intake. Although requirements of women of childbearing age are more than two times that of men, they are less likely to get enough. A majority of maternal deaths occur at or after birth caused primarily by hemorrhage, sepsis and toxemia.

This objectives of this paper are two-fold: (1) to describe the nutritional

status of women in rural regions in Pakistan and (2) to examine some of the determinants of women's nutritional well-being. In the latter, certain policy related determinants will be explored, such as the impact of income and price policies.

OVERVIEW OF NUTRITIONAL STATUS OF RURAL PAKISTANI WOMEN

The data used for the analysis below was drawn from a survey of five districts in rural Pakistan--districts of Attock and Faisalabad in Punjab, district Dir in NWFP, district Badin in the Sind and Mastung/Kalat in Baluchistan. Data on household income, expenditures, food consumption, farm production, time allocation, demography, and anthropometry were collected in the study households beginning in mid 1986 up to mid 1989. The survey design is described in Alderman and Garcia (forthcoming). Multiple visits totalling 12 rounds were made in these households. Anthropometric measurements and morbidity data were obtained for children and adults in four of those visits. These data comprise the main nutritional outcome information at the individual level of women.

The health and nutritional well-being of women in the sample are described by anthropometric and morbidity measures which include: body mass index (BMI, defined as weight divided by square of height) which is a measure of thinness, weight, height, and illness. Anthropometric deficits using the more commonly used cut-offs were estimated for the sample. For BMI, a cut-off of 18.5 has been suggested by James, Ferro-Luzzi and Waterlow (1988) is used to indicate chronic energy deficiency. In terms of heights and weights the cut-offs of 145 cm. and 45 kg. respectively are used since these are frequently used to indicate obstetric risk. The results are given in Tables 1 and 2 by income terciles for

Table.1--Pakistan: Mean BMI, weight, height of adult/male/female (15-59 years by Income Group

Income Group	Mean BMI		Mean Weight (kg)		Mean Height (cm)	
	Females	Males	Females	Males	Females	Males
Low	19.9	19.2	45.4	52.9	151.5	167.8
Middle	20.2	19.6	46.5	53.5	151.4	166.7
High	21.4	20.6	49.1	57.2	151.8	168.7
All	20.6	19.9	47.2	55.0	151.6	167.9
No. of observations	1995	2244	1943	2540	1805	2251

Table 2--Pakistan: BMI, Height, Weight, Illness Patterns Among Adult/Male/Female by Income Group (age-group 15-59 years)

	% BMI < 18.5		% Weight < 45kg.		% Height < 145cm.		% days sick last 2 weeks	
Income Group	Male	Female[1]	Male	Female[1]	Male	Female[1]	Males	Females[1]
Low	42	39	12.5	43	2	16	12	26
Middle	34	30	12.0	40	1	13	12	19
High	20	24	11.0	34	1	12	11	16
All	29	30	11.5	38	1	14	12	19
No. of observations	1995	2244	1943	2540	1805	2251		

[1] Non-pregnant non-lactating women only.

adult women. Data for men are also included in order to draw comparisons. The average BMI, weight and height of female adults tend to increase with increasing incomes. It is interesting to note that the mean BMI of women are somewhat higher than those of men at all income levels, although it is partly because men are much taller than women.

Deficits in height and weight can be due to both stunting and thinness, and it is therefore useful to examine direct measures of weight in relation to height. For this, the body mass index is a convenient indicator. Women in the highest income tercile have nearly twice the proportion of very thin women (below 18.5 BMI), which is an indication of a strong income effect. The overall level of thinness among women of around 39 % is much higher than those observed in China (18%) or in countries in Sub-Saharan Africa (23%)--ACC/SCN (1992).

Estimates of underweight adult women of 38% and stunting of 14% is high even compared to other developing regions of the world. These findings are generally in line with other observations about the health of Pakistani women. The prevalence of low birth weight in Pakistan which is about twice the incidence of other developing countries maybe related to the high prevalence of underweight women. This may also be the main reason for the high maternal mortality in Pakistan--for example, the low maternal anthropometry and anaemia predispose to maternal mortality.

Table 2 also summarizes the strong effect of income on morbidity. Females in the highest income tercile are found to be ill compared to the higher income women.

Anthropometric deficits among adult women in Pakistan may also be due to the differences in activity patterns. Very few women in the sample are engaged

in work outside the home--a situation which is typical in a Muslim society. However, the reproductive burden of Pakistani women is relatively higher because of the high fertility rates. Under such conditions, the demands of household work is quite high. But for those women who had to work outside the home, the double burden tend to affect their own nutritional status. This is shown in Tables 3 and 4. Thinness (below 18.5 BMI) is higher for women who had to work outside the home. Around 43% of those who worked outside the home for 5 to 8 hours a day had BMI below 18.5, compared to 32% who simply stayed at home.

DETERMINANTS OF WOMEN'S NUTRITIONAL STATUS

A multivariate analysis is used to examine the various determinants of women's nutrition in the sample households. Three anthropometric measures are used as dependent (outcome) variables: BMI, height and weight. The explanatory variables include individual characteristics (such as age, education, physiological and morbidity status, percent women earnings) as well as household level measures including household incomes per capita, prices of the selected food items.

Results given in Table 5 generally confirm the descriptive analysis. There is a significant income effect particularly with respect to thinness (BMI) and weight measures but not on height. The variable 'percent women's income' applies to the contribution of female members who are in the labor force. Results for BMI and weight regressions appear contradictory--that is when women are employed, the BMI levels also improves, but weight declines although the t-statistic for the latter is not significant. In effect the 'percent women's income' variable is a proxy for activity. Women's body weight in this case is more sensitive than BMI in assessing the impact of activity. The negative impact of morbidity is

Table 3--Time Allocation and Nutritional Status Indicators:
Females (15-59 years)

	Mean BMI	Mean Weight(kg)
Hours Work Outside Home		
Not Worked	20.7	48.1
1-4 hrs	19.7	48.7
5-8 hrs	19.7	47.9
>8 hrs	19.9	47.0
No. of Observations	2244	1943

Table 4--Time Allocation and Nutrition/Health Indicators: Females (15-59 years)

	BMI<18.5	Weight <45 kg.	Height <145cm	%Sick In last month
Hours Work Outside Home		(percent)		
Not worked	31.8	36.8	11.1	2.0
1-4 hrs	36.9	35.8	28.0	7.2
5-8 hrs	43.1	36.8	13.7	3.8
<8 hrs	___	37.3	18.0	3.6

Table 5—Determinants of adult women's BMI, height and weight

Intercept	18.140 (6.64)**	43.448 (6.68)**	154.215 (31.77)**
Per capita income	0.0002 (5.02)**	0.0005 (5.23)**	0.0003 (0.38)
Perecent women's income	0.0170 (1.84)**	-0.029 (-1.35)	-0.105 (0.63)
Age in years	0.029 (2.21)**	0.080 (2.51)**	0.012 (0.51)
Education in years	-0.508 (-1.03)	-0.393 (-0.33)	1.242 (1.42)
Education of household head	0.118 (2.31)**	0.330 (2.89)**	0.143 (1.68)*
Days ill in last two weeks	-0.110 (-0.94)	-0.445 (-1.60)*	-0.357 (-1.73)*
Pregnant (1=yes)	4.177 (5.61)**	8.446 (4.77)**	-1.287 (-0.97)
Head of household (1=yes)	-1.389 (-1.93)**	-2.870 (-1.68)*	0.643 (0.51)
Price of beef	0.251 (1.04)	-0.240 (-0.72)	-1.305 (-5.21)**
Price eggs	-3.463 (-2.43)**	-3.305 (-0.97)	8.878 (0.31)
Price of milk	0.549 (1.18)	2.280 (0.73)	1.542 (0.65)
N	556	556	556
F	11.1	15.4	11.56
R^2	0.18	0.23	0.18

* Significant at 0.10.

** Siginificant at 0.01.

T-values in parentheses.

seen only weight but not on BMI or height. Educational level of women themselves do not seem to affect their own nutritional status. On the other hand, the educational level of the male head of household tend to be associated with higher BMI, weights and height. The impact of prices are unclear. The price of beef appear to be of the expected negative sign for weight and height, but not for BMI.

The analysis controls for the physiological status of women--and results show that it is important to differentiate nutritional conditions of those who are pregnant. Women who are heads of households tend to be thinner and more underweight. The effect is strong and statistically significant. The conclusion in is that in Pakistan, it is likely that women-headed households are the poorest and more vulnerable.

SUMMARY AND CONCLUSIONS

Women's nutrition in rural areas in Pakistan improves with rising incomes of the household. This is given by measures such as the body mass index and weight. Height does not appear to be strongly affected by income. These measures however, do not give consistent results when activity patterns of women are factored in the analysis. BMI which is a measure of thinness tend to be positively related to higher activity in terms of women working outside the home. On the other hand, weights tend to be negatively correlated with activity. It thus seems that when one seeks to analyze the determinants of women's nutrition, that one should understand the characteristics that the various outcome measures. Is BMI a reasonable description of the problems? How sensitive are weights and cut-offs for describing anthropometric deficits?

There are non-economic factors that affect women's nutrition in this rural

setting. Women who are heads of households tend to be thin and underweight. Illness tend to have a negative effect on weights.

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Chapter IX.1

GENDER DIFFERENCES IN LEVELS, FLUCTUATIONS AND DETERMINANTS OF NUTRITIONAL STATUS: EVIDENCE FROM SOUTH-CENTRAL ETHIOPIA

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INTRODUCTION

As the rural development process progresses, subgroups of the population are often left behind. Traditionally, these subgroups have been identified by their income-generating capacity and/or asset holdings, and generally not disaggregated below the household level (Lipton with Longhurst 1989; von Braun and Lorch 1991). But income or wealth may not always be the best stratifier, and the household may not always be the best unit of analysis for identifying the rural poor, or for devising ways to reach the needy. Improving income earning potential has not always been sufficient to bring all household members up to acceptable levels of welfare (von Braun, Hotchkiss, and Immink 1989); in fact, research has demonstrated wide variations within households as regards the distributions of the benefits of rural development (Haddad and Kanbur 1992).

The welfare of the rural poor may, moreover, undergo wide seasonal fluctuations, dipping far below acceptable levels in times of food scarcity, high energy expenditure, or both combined (Longhurst and Payne 1981). These seasonal swings may threaten certain subgroups of the rural population more than others, because of not only the low levels to which nutritional status falls, but also the varying individual

capacities to "bounce back" from nutritional deficit, potentially resulting in a downward spiral.

Recent research in the Andes has shown, for example, that adults (particularly adult males) suffer more seasonal energy stress than children (Leonard 1991). This seasonal dimension can be easily overlooked in studies, even those disaggregated below the household level, that rely on assessments of individual welfare made at a single point in time, or temporal averages.

The Andean example also underlines that (age- and gender-specific) energy expenditure patterns underlying household-sustaining activities can affect nutritional status. Child labor provided the household with its means for day-to-day maintenance across food-scarce and food-abundant seasons, and in no season was the demand for male labor well-differentiated from that of female (i.e., great strength was not a factor) (Leonard 1991).

In the same way, higher household income need not necessarily translate into higher nutritional status for household members, since factors such as energy expended to generate income, or time allocated elsewhere because of income, as well as control over income, can determine the "transferability" of the benefits of increased household income to age and gender groups within the household (see Overview, current volume). This series of links mediating the effect of household income on nutritional status suggests that: a) income <u>source</u>, each possibly implying its own age/gender energy expenditure demands on a household, can make a difference for nutritional status; and b) income <u>timing</u> is critical, given seasonal patterns in calorie availability to "weigh" against seasonal energy expenditure. In addition, household <u>structure</u> may be critical to these income "filters," e.g., placing

constraints on energy expenditure choices, and allowing possibilities for substitution of one individual's energy expenditure for another's.

For policymakers seeking clues as to how to boost rural welfare, understanding these income links can help determine where, when, and how to intervene -- at the individual, or household level; during the food-scarce season, or prior to it; through a particular type of income-generating scheme, or through direct health interventions.

This study examines anthropometric measures (proxies for nutrition and health status, and welfare) over several agricultural seasons for four subgroups defined by age and gender -- adult males, adult females, male preschoolers, and female preschoolers -- within rural households in south-central Ethiopia. The nutritional status of females is set against that of males, for both adults and children, with statistical tests assessing differences across these intra-household subgroups. In addition, seasonal assessments of fluctuations in nutritional status from food-abundant to food-scarce seasons, and from food-scarce back to food-abundant seasons, are made for each of the age/gender groups identified using longitudinal data. Analysis of determinants of nutritional levels and changes seeks to test the impacts of individual, household structure, household income, and household agricultural production variables by subgroup to suggest ways to "target" vulnerable subpopulations.

The first section of the paper discusses sample data and measurement issues. It's followed by a section describing the nutritional status of the initial sample and a smaller subsample on which the study focuses -- namely, those for whom longitudinal data are available. The next section explores gender differences in nutritional status (with the sample divided into those well nourished, moderately

malnourished, and severely malnourished) among adults and children through the seasons of one annual cycle, and introduces the income per capita measure as a stratifier. Then, multivariate analysis examines how determinants of first an annual, then seasonal, measures of nutritional status vary from males to females among adults and children. Analysis of determinants of the magnitude of nutritional swings going into, and coming out of, the food-scarce season is then presented.

Estimated equations include income levels, as well as timing and source of income as explanatory variables, along with household structure variables, household agricultural production variables, and individual characteristics. The conclusion sums up important findings, and raises implications for policymakers.

DATA AND MEASUREMENT ISSUES

The data analyzed here were collected from four rural peasant associations in Sike awraja, in Southern Shewa province, Ethiopia, roughly once a month from August 1990 through September 1991, as part of a project sponsored by the Ethiopian Nutrition Institute (ENI), the Italian Nutrition Institute (INN), and the International Food Policy Research Institute (IFPRI).

The study area is one of bimodal rainfall, with the "lean" season beginning around April, and ending as harvests from the "short," less reliable spring rains come in starting in August (fresh maize), followed by the main harvests from the summer's "long," heavy rains. Our study period encompasses three seasons (i.e., one annual cycle) in terms of nutritional status, two relative food "surplus" periods (in the fall of 1990, and again in the fall of 1991), and one "lean" season, in the spring of 1991.

For adults (over 18 years old), the nutritional measure used is Body Mass Index -- or BMI -- (kg/m^2). Those over 18.5 BMI are considered well nourished, those below 16 BMI severely malnourished, and those between 16 and 18.5 BMI moderately malnourished.[1] For children up to six years old, a medium-term nutritional measure -- weight-for-age z-score, as compared with a standard NCHS (U.S. National Center for Health Statistics) sample -- is used. Those falling more than two standard deviations below the standard distribution's weight-for-age mean are termed severely malnourished, between one and two standard deviations below are moderately malnourished, and the remainder well nourished.[2]

NUTRITIONAL STATUS OF THE SAMPLE

Figures 1 and 2 depict the nutritional status of the initial sample by gender, age, and physiological status, over the annual cycle August 1990 - September 1991.[3] Several points emerge from the graphs:

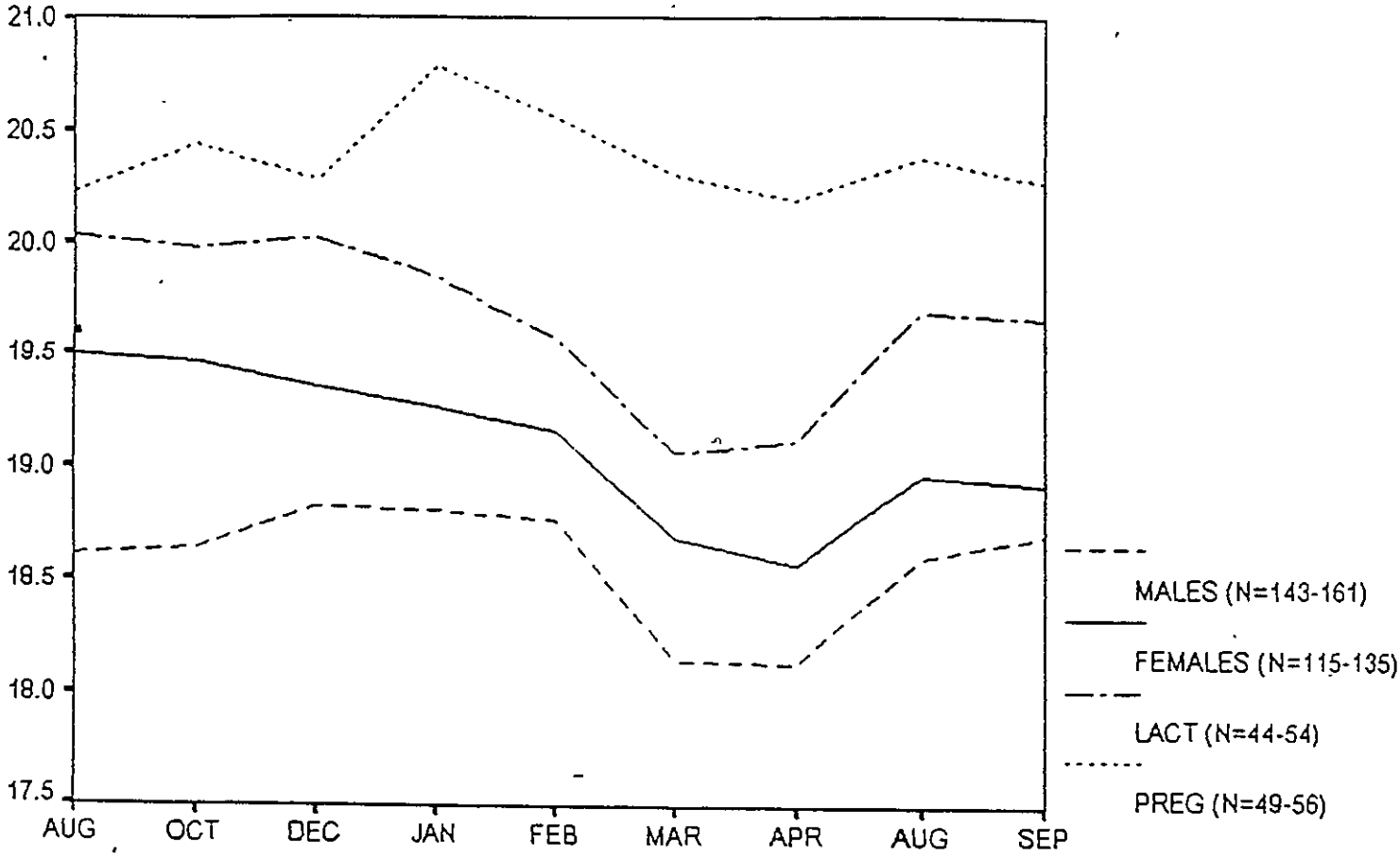
a) On average for each round, females (both adults and children) were better off than males, with children of both sexes suffering more severe malnourishment than adults (with means for both sexes below -2 weight-for-age z-score for most of the year); and

b) Across the year, each group (women, regardless of physiological status, men, girls, and boys) exhibited seasonal trends in nutritional status, with a "trough" in March and April and a "rebound" by August. While men on average proved resilient nutritionally, rebounding by the second surplus season in September 1991 to their (relatively

Figure 1:

ADULT BMI (MEAN)

SIKE AWRAJA, ETHIOPIA (1990-1)



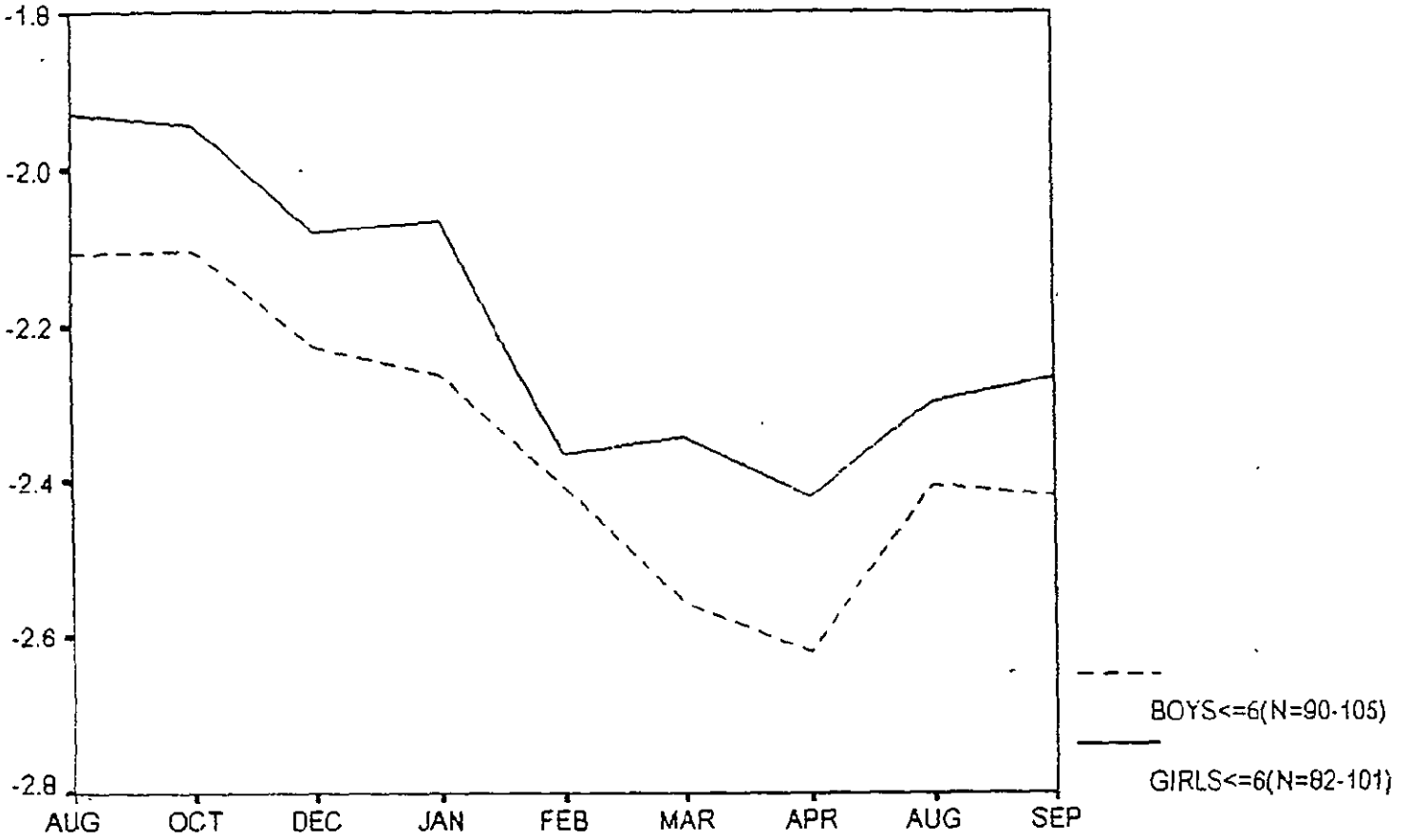
*Note that N varies by round.

*Note that all months are not represented.

Figure 2.

W/A Z-SCORE (MEAN)

SIKE AWRAJA, ETHIOPIA (1990-1)



*Note that N varies by round.

*Note that all months are not represented.

low) nutritional levels of the previous August, women and children -- the latter starting out at a grave level of malnourishment -- failed to make that recovery.

To be able to examine seasonal changes in, and an overall year-long measure for, nutritional status, we selected from the above sample (where means were calculated cross-sectionally, per round, for those with valid measurements) those who had at least one valid measurement for each of the two "peak," and one "trough," seasons (hereafter referred to as Surplus 1, Surplus 2, and Lean 1, respectively).[4]

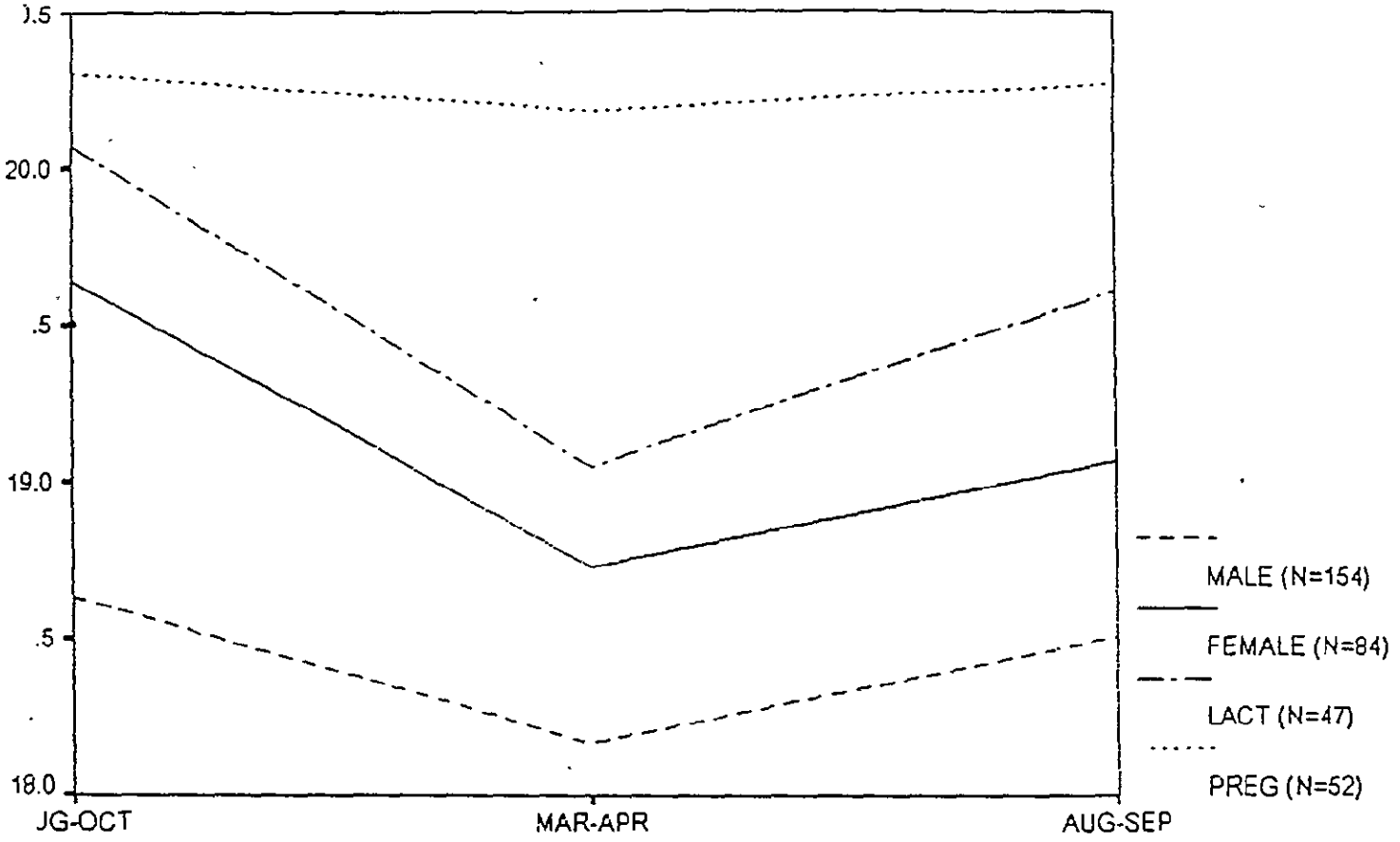
Figures 3 and 4 depict the seasonal mean BMI and weight-for-age z-scores for the reduced, longitudinal sample, and suggest that, in the selection process, the larger sample's patterns are retained: a) a clear decline in the Lean 1 season for each age/gender/physiological status group; and b) a higher, on average, nutritional level for females than males. Note also that the apparent "gender gap" of adult females over males was widest during the initial Surplus 1 season, and narrows moving into the Lean 1 season. But the lean season was apparently not a great "equalizer" between the sexes, even at a lower nutritional status: boys' average nutritional status came closest to the girls' in Surplus 1, and widened going into the lean season (Figure 4), reversing the gender pattern seen among adults.

To hone in on populations at risk seasonally, each individual was characterized as well nourished, moderately malnourished, or severely malnourished (according to the criteria laid out in the previous section) for each season. Figure 5 shows starkly how many children were at risk, and how few sample adults severely malnourished -- the solid black area denotes share of sample in the lowest nutritional category (<16 BMI for adults,[5] and <-2 weight-for-age z-score for children). It

Figure 3:

ADULT BMI (MEAN)

SIKE AWRAJA, ETHIOPIA (1990-1)

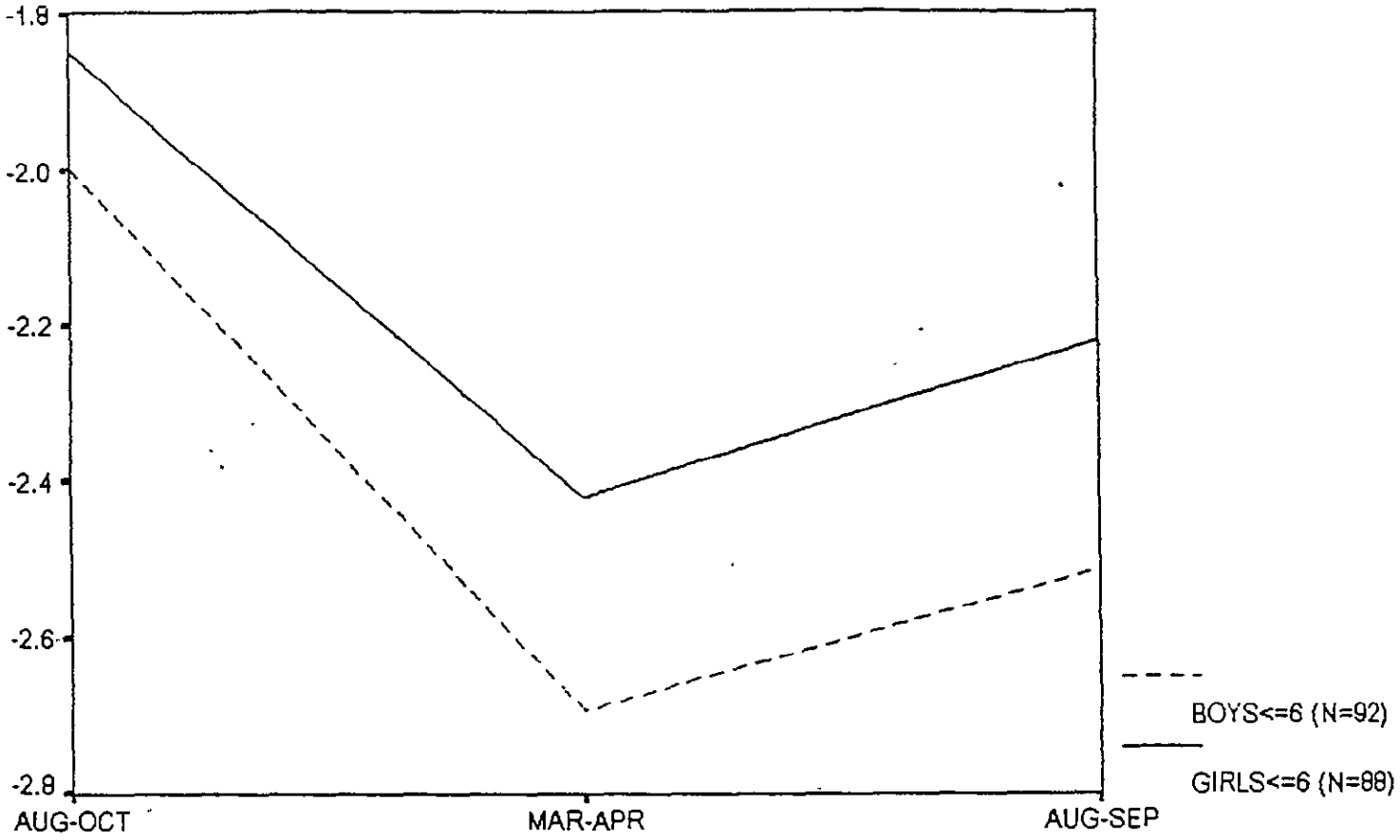


*Each "season's" BMI consists of one of two months' BMI, or, if both are available, their average.

Figure 4.

W/A Z-SCORE (MEAN)

SIKE AWRAJA, ETHIOPIA (1990-1)



Each "season's" w/a z-score consists of one of two months' w/a z-score measurements, or their average, if both are available.

also highlights seasonal shifts: among adults of both sexes, a move into the lean season (Lean 1) may have meant a drop in nutritional status category (often to moderate malnourishment), but the early harvest that followed brought recovery to the Surplus 1 scenario. Among preschoolers, though, where the number of severely malnourished jumped substantially (by nearly 20%) during the lean season (Lean 1), the Surplus 2 season brought little relief: among girls, the proportion severely malnourished dropped by 5% from the lean season; among boys, by only 1%. The more rigorous statistical tests of these fluctuations and reasons behind this difference in seasonal resilience from adults to children, and (although at a higher nutritional level) between men and women, will be explored further in Section V below.

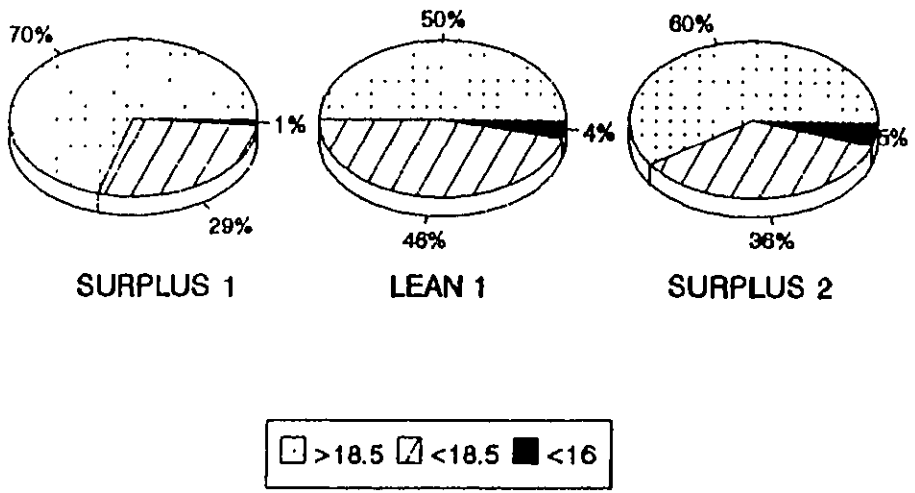
IV. Links between Nutritional Status and Income -- a Descriptive Look

To explore links (if any) between income levels and nutritional status, a measure for household "income" suited to the region, and the problem, was required. Household consumption of output far outweighed its marketing in all four peasant associations studied, and "food-for-work" projects in the area paid wages in kind. The household "income per capita" measure used captured the value of household output, as well as cash income flows, in the belief that both together influence nutritional status.[6]

Table 1 presents results of statistical comparisons of nutritional status across (household-level) income per capita terciles for particular age/gender groups, as well as gender, and seasonal, nutritional status comparisons within age and income groups. Comparisons yielded significant (at the 5% level) differences <u>across income terciles</u> only for boys, where the average weight-for-age z-score

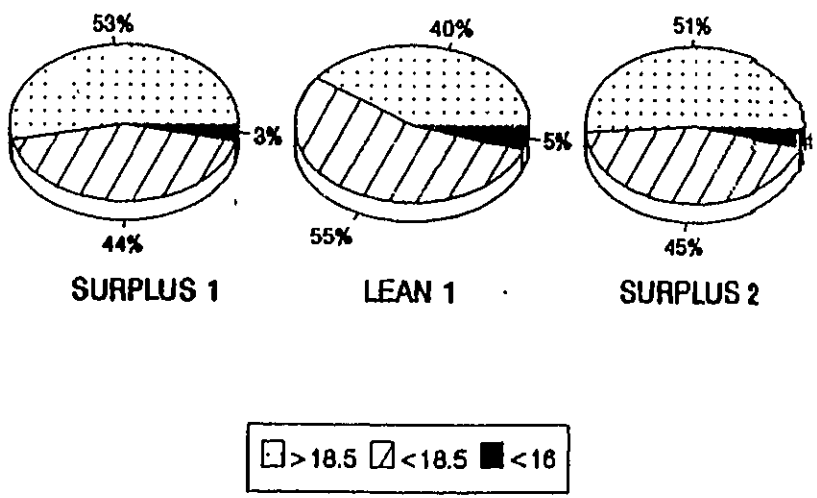
Figure 5.

FEMALE BMI



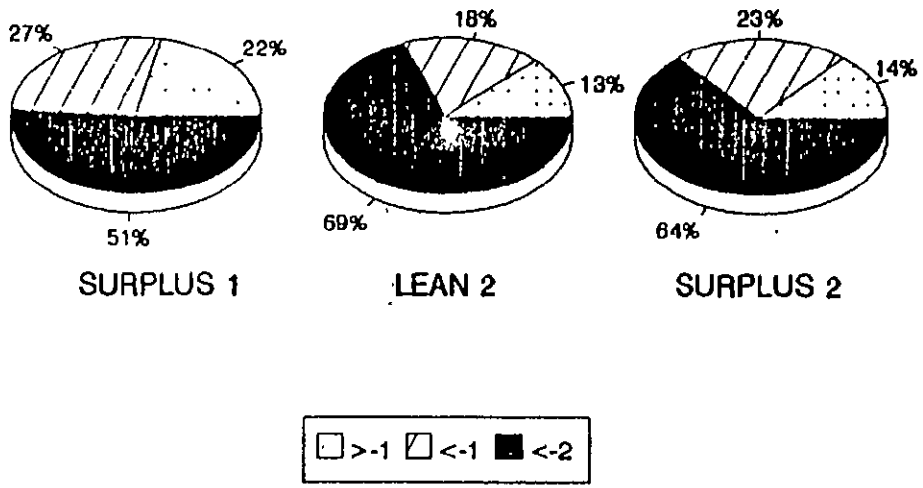
N=84

MALE BMI



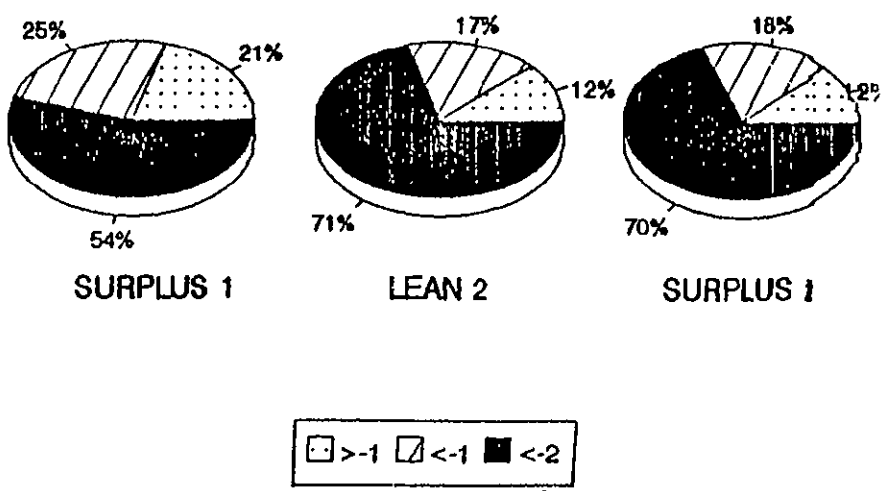
N=154

W/A Z-SCORE (FEMALE<=6)



N=88

W/A Z-SCORE (MALE<=6)



N=92

Table 1:

INCOME PER CAPITA TERCILE (AUGUST 1990-SEPTEMBER 1991)

SEASONS	ALL INCOME PER CAP LEVELS				LOW (<119.6 ETB*)				MID (119.6-224.6 ETB*)				HIGH (>224.6 ETB*)			
	BMI		WAZ		BMI		WAZ		BMI		WAZ		BMI		WAZ	
	M	F°	M	F	M	F°	M	F	M	F°	M	F	M	F°	M	F
ALL SEASON MEAN	18.42 ***	19.15	-2.37	-2.13	18.32	18.18	-2.90'' **	-2.24	18.45	19.40	-2.32	-2.10	18.50 *	19.22	-1.79''	-2.08
SURPLUS 1 (Aug/Oct 1990)	18.61 *** #	19.67 #X	-1.95 #	-1.82 #	18.56 *	19.51	-2.52''	-1.88	18.60 ***	19.75	-1.90	-1.80	18.67 **	19.72	-1.33''	-1.77
LEAN 1 (Mar/Apr 1991)	18.16 **	18.74	-2.58	-2.39	17.99	18.46	-3.27''	-2.50	18.20 *	18.89	-2.58	-2.39	18.27	18.83	-2.03''	-2.31
SURPLUS 2 (Aug/Sep 1991)	18.50 **	19.04	-2.48	-2.20	18.42	18.45	-2.91''	-2.32	18.54 ***	19.54	-2.46	-2.11	18.57	19.10	-2.00''	-2.16
N	142	75	88	86	46	22	34	27	48	22	25	27	48	31	29	32

* 2.07 ETB (Ethiopian Birr) = 1 US$.

° Adult females are non-pregnant, non-lactating.

' Across-season (Surplus 1 to Lean 1) significant difference at 5% level in nutritional status for a given age/gender group.

X Across-season (Lean 1 to Surplus 2) significant difference at 5% level in nutritional status for a given age/gender group.

'' Across-tercile (high and low income terciles) significant difference at 5% level.

*, **, *** denote across-gender significant differences at 10%, 5%, and 1% levels.

was significantly lower for the bottom income tercile group, than for the top, both year round (row 1, column 7),[7] and in each season (rows 2, 3, and 4, column 7) -- a difference denoted by a "++" in Table 1.

Gender comparisons confirmed that, for adults, females had significantly higher nutritional status scores than did males, in each season as well as year round (with all income groups considered together). In the Surplus 1 season, men scored lower than women in all income groups. As the year progressed into the Lean 1 season and the early harvest Surplus 2 season, however, gender differences in nutritional status disappeared among those with highest and lowest incomes persisting at the middle income level: men from the middle income tercile scored lower than women in every season.

For children, gender differences in nutritional status emerged only among the poorest: boys from the lowest income tercile scored significantly lower on weight-for-age z-scores (again, year round, and in each season) than females.

Table 1 also documents statistically significant swings in nutritional status seasonally pointed up by the descriptive analysis up until this point. Among all age/gender groups -- adult males, adult females, boys, and girls -- the Lean 1 (lean season) mean for nutritional status marked a significant drop (at the 5% significance level) from Surplus 1, but in no case did the Surplus 2 season herald a significant "rebound" in nutritional status from the lean season. Within income terciles, no nutritional status swings were statistically significant.

Confirmed, then, are some gender and age differences in nutritional status (some of which vary seasonally), raising a "red flag" to policymakers that children within households need help, and that men

are actually worse off than women. Also confirmed are seasonal swings in nutritional status, and policymakers' concern with status in the food-scarce season, and perhaps its aftermath. A positive link between household income levels and nutritional status was established only for boys under six, casting some doubt on the capacity of any income-generating scheme alone to improve nutritional status for all intrahousehold subgroups.

MULTIVARIATE ANALYSIS

To test for the simultaneous influence of gender, income, and other individual- and household-specific factors in determining individual nutritional status, a more comprehensive, multivariate analysis was required.

Individual characteristics such as age, and, for adults, marital and physiological status as well as literacy were included as explanatory variables. Household structure variables such as dependency ratio, and sex ratio for adults were included to control for type of labor (age and gender subgroup) available "in house," and the potential for substituting across household members for age- and sex-specific chores/income-generating activities. A dichotomous variable indicating polygamous household was included to pick up the presence of advantages/disadvantages vis-a-vis nutritional status stemming from this arrangement (which usually involves multi-dwelling households), holding all else (including intrahousehold gender and dependency ratio) constant. The children's equation tests other variables explicitly related to household structure for nutritional status effects: coresidence with a literate household head (expected to mean improved nutritional status), and mother's nutritional status to test whether

improved maternal nutritional status permits activities that boost child's nutritional status, or whether there's a trade-off between maternal and child status -- i.e., the mother "mines" her own nutritional status in order to pass along benefits to her children, or boosts it at their expense.

Other household variables include gross cropped area per capita, meant to provide some measure of the land resources with which the household can generate "income," and which places agricultural production demands on the household. In addition, proportions of gross cropped area involved in various sharing arrangements (obligating household -- usually male -- labor to be spent on others' plots in a "sharing in" arrangement, or others to spend labor on household plots in a "sharing out" arrangement), were included to capture possible "multiplier effects" on household labor stemming from (or permitted by) such arrangements.

Finally, a set of income variables (based on our income measure, described above) is included -- income levels (expressed as natural logarithm), income sources, and timing of income flows seasonally to try to capture time lags (if any) between income generation, and nutritional results

Determinants of Annual Nutritional Status Measures

Average annual BMI (for adults) or weight-for-age z-score (for children) was the dependent variable for equations run separately for each gender, with the series of individual, household structure, household agricultural production, and household income characteristics described above as independent variables (see results, Table 2). The equations went much further in explaining female BMIs than male BMIs,[8]

Table 2:

REGRESSION RESULTS

Independent Variables	BMI - 3 Season Mean		W/A Z-score - 3 Season Mean	
	Male	Female	Male	Female
Individual				
Age (yrs.)	-0.01	-0.04***	-0.24***	-0.07
Widowed (0/1)[a]	1.48	-0.05	-	-
Illiterate (0/1)[a]	-0.44	-0.59	-	-
Lactating (0/1)[a]	-	0.36	-	-
Pregnant (0/1)[a]	-	0.42	-	-
Household Structure				
Polygamous (0/1)[a]	0.01	-1.03***	0.01	-0.62
Dependency Ratio (<15, >65/HH size)	0.35	-0.92	1.24	-0.92
Sex Ratio (women/adults)	0.24	0.16	0.33	1.44
Illiteracy of household heads living in hut (0/1)[a]	-	-	-0.82***	0.02
Mother's BMI (3-season mean)	-	-	0.03	-0.22
Household Agricultural Production				
GCA/capita (has./person)	-0.45	-0.29	-0.54	-0.98
Proportion GCA shared in	-0.09	-2.76**	-1.77	-0.51
Proportion GCA shared out	-0.21	-0.32	0.49	0.75
Income				
Log of income per capita[b]	0.14	0.69***	0.84***	0 40
Share from animal sales[c] (VTO)	0.99	2.04**	0.88	1.50
Share from livestock products[c] (VTO)	-0.56	0.41	3.00**	0.06
Share from wages[c]	0.30	-0.16	1.71	I.20
Share from Surplus 1[d]	-1.51**	-0.44	-0.88	0.38
Share from Surplus 2[d]	-1.89**	-1.84**	-0.51	-3.01**
Constant	18.79***	19.00***	-6.98***	0.78
$\bar{R}^2$	0.04	0.21	0.33	-0.08
N	139	156	85	132

[a] For all dichotomous variables, a "1" indicates the condition specified by the variable name; cases are assigned a "0" otherwise.

[b] With "Income" consisting of the Value of Total Output (VTO) for crops and livestock products, plus income from wages and animal sales

[c] Omitted category is share from crop VTO.

[d] Omitted category is share from Lean 1 season. Income for a given season is earned/produced the end of the previous season, and the given season's end.

*, **, *** denote significance levels of 10%, 5%, and 1%, respectively.

and male weight-for-age z-scores than female. Some factors influenced male nutritional status, but not female, and vice versa.

Being part of a polygamous household, for example, was associated with significantly lower female, but not male, BMIs, suggesting that women living in polygamous households may differ from others in energy intake, energy expenditure, or both. Higher proportion of household gross cropped area shared in also had a negative effect on female, but not male, BMIs; perhaps, with more of household male labor expended on others' plots, women's workload at home increases by more than is compensated (them) by the extra food inflow at harvest time. Gross cropped area per capita, on the other hand, was not tied to any subgroup's nutritional status.

The sensitivity of women's, but not men's or children's, nutritional status to these household structure variables implies complicated trade-offs in energy expenditure/intake for women in a given context, which may, over time, redound on the welfare of the rest of the household. This finding justifies an intrahousehold focus with gender sensitivity for policymakers and others despite the fact that, as individuals, women are generally better off nutritionally than men, as in this sample. By including mother's three-season BMI in the children's annual average nutritional status equation, we tested for such a "maternal productivity" effect, and found none. The aggregation across seasons may mask important variation within seasons, however, or welfare effects on the household of women's behavior may exist, but not be captured with this variable.

Level of income per capita (the measure of value of output, animal sales, and wages, as described above in Section IV), as well as its source and timing throughout the year also influenced nutritional status

differently for males vs. females. More income per capita was associated with higher female BMIs and male child weight-for-age z-scores, but not linked to adult males' or female children's nutritional status: income generated is "transmitted" into higher nutritional status only for certain intrahousehold subgroups, holding income sources and timing constant.

Household adult females' nutritional status benefitted the larger the share of annual "income" per capita from animal sales vis-a-vis crop production. If our income source classification does capture different types of energy expenditure patterns, this finding suggests that benefits accrue to women from animal sales (perhaps due to livestock care foregone) vis-a-vis crop production (perhaps due to the heavy female role in many processing activities after the harvest). Adult female nutritional status (averaged over the three seasons) also benefitted more from income generated during the Lean 1 season (the main harvest and its aftermath, going into the lean season), vis-a-vis the Surplus 2 season (the early rain's harvest), while, for men, Lean 1 season income had a significant positive impact on BMI vis-a-vis both Surplus 1 and Surplus 2 seasons. This finding underlines the point, important for policymakers to keep in mind, that a given amount of income may do little good to a family unless it is available at resource-scarce moments -- in other words, timing is critical, and income may not only be too little, but often comes too late.

For boys, greater reliance for "income" on livestock product production vis-a-vis sales of animals was associated with boosted weight-for-age z-scores -- a finding not replicated for girls. One interpretation of this result is that assets may be more beneficial to children's nutritional status when they mean easily <u>accessible</u> calories

(e.g., fluid milk), than when they're sold off (especially in regions with unpredictable markets) (see Vosti and Witcover 1991, for evidence from Brazil's rural poor).

Among adult females and male preschoolers, nutritional status tended to decline among older individuals. Literacy of a household head (male or female) from the same dwelling as the child boosted male, but not female, preschooler nutritional status, but an adult's <u>own</u> literacy was unimportant in determining his/her nutritional status. Education, therefore, has a role, if possibly a limited one, to play in raising nutritional status. By the same token, given that fully 95% of the female sample was illiterate, possible nutritional gains within the household due to increased female literacy were difficult to detect adequately.

Only one explanatory variable was significantly linked to female preschooler nutritional status: higher shares of annual income coming in the Surplus 2 season vis-a-vis the Lean 1 season meant lower weight-for-age z-scores for girls under six. That the same set of variables that do quite well in explaining variation in nutritional status among adult females and boys fails so utterly here is in itself an important finding -- not only underlining how little is known about nutrition determinants for this household subgroup, but pointing to important differences in the way boys and girls "fit" into these rural households in terms of energy intake/expenditure patterns. For policymakers, it may be important to keep in mind that policies targeting children may not reach boys and girls equally.

Determinants of Seasonal Nutritional Status Measures, and of Seasonal Swings in Nutrition

The above regressions were performed on average annual nutritional status, smoothing over swings in nutritional status from "abundant" to "lean" season (swings depicted above, in Figure 5 pie charts). Responses to, as well as determinants of, nutritional status may well differ from the abundant to the lean season, and between male and female in each season, as time allocation/energy expenditure patterns shift. Regressions for nutritional status per season, and changes from one season to the next, were run to try to pinpoint these differences. Regression results for adults appear in Table 3, results for preschoolers appear in Table 4. Table 5 presents descriptive statistics for the individuals and households included in the final regressions.

A. *Seasonal Nutritional Status and Seasonal Swings among Adults*

Several of the results from the year-round BMI regressions persisted regardless of season, especially for adult females (see regression results, Table 3). Namely, the significantly negative effects for women of being part of a polygamous household, and the negative impact of relatively large proportions of household GCA shared in, recurred in each season. Also, older women fared worse, regardless of season. This replication of results across season implies a relationship to nutritional status of these variables that exists regardless of the energy intake/expenditure shifts undertaken seasonally.

Evidence emerged that a higher household dependency ratio (of dependents to household members) took a toll on adult female BMI, but since the result appeared only in one of the two surplus seasons (Surplus 1), it is difficult to label this a recurring seasonal effect

Table 3: REGRESSION RESULTS

Independent Variables	BMI						BMIDIF			
	Surplus 1		Lean 1		Surplus 2		Surplus 1-to-Lean 1		Lean 1-to-Surplus 2	
	M	F	M	F	M	F	M	F	M	F
Individual										
Age (yrs.)	.001	-.05***	-.01	-.18**	-.01	-.04**	-.01*	-.01	-.01	.003
Age[a]	-	-	-	.002*	-	-	-	-	-	-
Widowed (0/1)[a]	1.31	.03	2.00*	.09	1.46	-.28	.70	.18	-.17	-.32
Illiterate (0/1)[a]	-.40	-.42	-.45	-.59	-.36	-.78	-.21	-.56	.13	-.14
Lactating (0/1)[a]	-	.36	-	.76**	-	.39	-	01	-	-.01
Pregnant (0/1)[a]	-	-.08	-	.35	-	.44	-	.86***	-	-.01
BMI starting season[b]	-	-	-	-	-	-	-.13***	-.24***	-.46***	-.44***
Household Structure										
Polygamous (0/1)[a]	.19	-.81***	- 01	-.74**	.06	-.99***	-.14	-.17	-.10	.03
Dependency Ratio (<15+>65/HH size)	-.55	-1.69*	.28	-1.20	.56	-.42	-.07	.43	.49	.94
Sex Ratio (women/adults)	.57	-.53	-.12	-.01	.23	.46	-.86**	.19	-.16	.42
Household Agricultural Production										
GCA/capita (has./person)	.58	.43	.25	.30	-1.90	-.04	-.25	.28	-.69	.07
Proportion GCA shared in	.13	-2.05**	-.56	-2.93***	-.16	-2.66***	-.44	-1.00	-.14	.58
Proportion GCA shared out	-.29	.09	-.63	-.04	-.51	-.60	-.32	-.28	-.21	-.30
Income										
Log of income per capita[c]	-.09	.05	.19	.69***	.02	.77***	.15	.48***	-.03	.17
Share from:[d]										
animal sales	1.28	2.87*	1.47	2.11**	1.14	1.72	.52	.74	-.30	.57
livestock products (VTO)	.46	.91**	-1.95	.52	1.43	.56	-1 02	.87	-.13	.03
wages	1.08	-.05	1.14	.31	10	-.11	16	.33	-.68	.94
Surplus 1[e]	-	-	-	-	-2.12***	-.73	-	-	-.98***	-.58
Surplus 2	-	-	-	-	-.94	-1.19	-	-	2.03**	1.59
Seasonal share of:[f]										
crops	-	-	-1.19***	-.39	-.32	-.003	-.49**	-.04	-1.16	-.97
livestock products	-	-	.07	.44	1.04*	-.23	-.19	- 01	-.20	.08
animal sales	-	-	-.41	1.52	-.02	-.34	-1.25***	-.38	.02	-.27
wages	-	-	.13	-.66	-.52	.50	-1.08	-.26	-.10	-.09
Constant	18.21***	22.92***	-127.00	23.92***	19.63***	18.03***	-49 07	-71.12	.59	-1.51
$\bar{R}^2$	-0.01	.13	.07	.25	.06	.17	.20	.23	.20	.14
N	139	166	139	166	139	166	139	166	139	166

*, **, *** denote significance levels of 10%, 5%, and 1%, respectively.

[a] For all dichotomous variables, a "1" indicates the condition specified by the variable name; cases are assigned a "0" otherwise.

[b] Refers to BMI for Surplus 1 in the first set of equations, and the difference between BMI in Surplus 1, and BMI in Lean 1, in the second set of equations

[c] With "Income" consisting of the Value of Total Output (VTO) for crops and livestock products, plus income from wages and animal sales, for seasons up to and including the season analyzed (i.e., a different measure for each equation).

[d] Crop VTO is the omitted category. "Share" refers to share of the current income measure for each equation

[e] Share from Lean 1 is the omitted category.

[f] Seasonal share refers to, for the "Lean 1" and "BMIDIF for Surplus 1-to-Lean 1" equations, the Surplus 1 season share of a given type of income (e g., crops) of the (e.g , crop) income generated in the Surplus 1 and Lean 1 seasons For the "Surplus 2" and "BMIDIF for Lean 1-to-Surplus 2" equations, it refers to the Surplus 2 season share of income type for the 3-season period.

Table 4: REGRESSION RESULTS

Independent Variables	WAZ						WAZDIF			
	Surplus 1		Lean 1		Surplus 2		Surplus 1-to-Lean 1		Lean 1-to-Surplus 2	
	M	F	M	F	M	F	M	F	M	F
Individual										
Age (yrs.)	-.98***	-.23*	-.15**	-.01	-.19***	-.05	.63***	.56***	-.03	-.01
Age^2	.10**	-	-	-	-	-	-.09***	-.05**	-	-
WAZ starting season[a]	-	-	-	-	-	-	-.28***	-.13***	-.07	-.11
Household Structure										
Polygamous (0/1)[b]	.64	.35	.23	-.30	-.30	-.76	.09	-.11	-.24	-.05
Dependency Ratio (<15+>65/HH size)	.89	-1.76	.92	-.74	-.07	-1.75	-.58	.43	-.66	.06
Sex Ratio (women/adults)	.80	1.19	.37	.77	.42	1.06	-.39	-.10	-.19	-.57
Illiteracy head (0/1)[b]	-1.32***	.29	-1.09***	.24	-.80***	-.04	-.42	.20	.18	.11
Mother's BMI[c]	-.02	-.01	-.01	-.20	-.07	.21	.03	-.07	-.02	.01
Household Agricultural Production										
GCA/capita (has.)	1.68	-.65	.19	-.59	-.03	-.80	.46	-.46	.23	.27
Proportion GCA shared in	-.46	-1.13	-.66	-1.57	-.89	-1.50	-.26	-.08	-.15	-.16
Proportion GCA shared out	.19	.36	.96	.44	.54	.82	.46	-.31	-.05	-.31
Income										
Log of income per capita[d]	.20*	-.02	.83***	.36	.61***	.23	.23**	.29**	-.24*	.06
Share from:[e]										
animal sales	1.88*	-9.98	1.14	.09	.53	.26	-.23	.65	-.03	-.99*
livestock products (VTO)	1.64***	-.37	3.22**	- 23	2.61	.37	.78	1.73**	-.88	-.22
wages	-.55	1.20	-2.92	-1.13	2.04	-.76	-2.00	.61	1.12	-.25
Surplus 1[f]	-	-	-	-	-.15	.19	-	-	46	-.49
Surplus 2	-	-	-	-	-2.42	-2.43	-	-	-1.00	1.60*
Seasonal share of:[g]										
crops	-	-	-.75*	-.02	1.91	-.03	-.17	-.23	1.37	-.77
livestock products	-	-	.72	-.10	.52	-.50	.24	-.08	.31	-.29
animal sales	-	-	.19	-1.02	.37	.42	-.41	-.05	.21	-.13
wages	-	-	-1.80	3.04	.87	.58	-.90	.26	.34	.13
Constant	-1.54	-.38	-119.66	-13.17	-5.09***	-2.07	19.74	-66.47	1.59*	-.32
$\bar{R}^2$	.32	-.04	.34	-.16	.23	-.13	.59	.57	.01	-.07
N	85	78	85	78	85	78	85	78	85	78

*, **, *** denote significance levels of 10%, 5%, and 1%, respectively.

[a] Refers to WAZ for Surplus 1 in the first set of "WAZDIF" equations, and the difference between WAZ in Surplus 1, and WAZ in Lean 1, in the second set of equations.

[b] For all dichotomous variables, a "1" indicates the condition specified by the variable name; cases are assigned a "0" otherwise.

[c] Refers to mother's Surplus 1 Season BMI for "Surplus 1" and "Surplus 1-to-Lean-1" equations; to mother's BMIDIF1 for "Lean 1" equations; and to mother's BMIDIF2 for "Surplus 2" and "Lean 1-to-Surplus 2" equations.

[d] With "Income" consisting of the Value of Total Output (VTO) for crops and livestock products, plus income from wages and animal sales, for seasons up to and including the season analyzed (i.e., a different measure for each equation).

[e] Crop VTO is the omitted category. "Share" refers to share of the current income measure for each equation.

[f] Share from Lean 1 is the omitted category.

[g] Seasonal share refers to, for the "Lean 1" and "WAZDIF for Surplus 1-to-Lean 1" equations, the Surplus 1 season share of a given type of income (e.g., crops) of the (e.g., crop) income generated in the Surplus 1 and Lean 1 seasons. For the "Surplus 2" and "WAZDIF for Lean 1-to-Surplus 2" equations, it refers to the Surplus 2 season share of income type for the 3-season period.

Table 5:

Descriptive Statistics

Variables	Season 1		Season 2		Season 3		All Seasons		
	Mean	(Std. Dev.)	Mean	(Std. Dev.)	Mean	(Std. Dev.)	Mean	(Std. Dev.)	N
Household Structure									
Polygamous (0/1)[a]	-		-		-		0.22	(.42)	140
Sex Ratio (women/adults)	-		-		-		0.53	(0.19)	140
Dependency Ratio (<15+>65/Household Size)	-		-		-		0.45	(.71)	140
Household Size (persons)	-		-		-		6.92	(3.15)	140
Household Agricultural Production									
GCA/capita (has.)	-		-		-		0.25	(.18)	140
Proportion GCA shared in	-		-		-		0.06	(.17)	140
Proportion GCA shared out	-		-		-		0.09	(.22)	140
Hut									
Illiterate Heads	-		-		-		0.76	(.22)	164
Income									
Income per capita (ETB)	46.95	(51.39)	115.23	(94.09)	57.81	(71.63)	220	(165)	140
Share[a]	0.21	(.21)	0.56	(.30)	0.23	(.19)	-		140
Crops (VTO)	0.55	(.45)	0.72	(.26)	0.38	(.41)	0.76	(.18)	140
Livestock Products (VTO)	0.24	(.28)	0.14	(.20)	0.31	(.38)	0.11	(.12)	140
Wages	0.03	(.15)	0.02	(.05)	0.15	(.28)	0.03	(.06)	140
Animal Sales	0.01	(.09)	0.10	(.18)	0.04	(.20)	0.10	(.15)	140
Seasonal Share of[c]:									
Crops (VTO)	0.26	(.27)	0.57	(.34)	0.17	(.20)	-		140
Livestock Products (VTO)	0.16	(.21)	0.35	(.28)	0.31	(.27)			140
Wages	0.02	(.10)	0.15	(.34)	0.07	(.25)			140
Animal Sales	0.03	(.13)	0.34	(.44)	0.26	(.40)			140

Individual[a]	Male Mean (SD)	Female Mean (SD)	Male Mean (SD)	Female Mean (SD)	Male Mean (SD)	Female Mean (SD)	Male Mean	(Std. Dev.)	Female Mean	(Std. Dev.)
Adult (>18)[a]										
Married (0/1)[a]	- -	- -	- -	- -	- -	- -	0.81		0.80	
Widowed (0/1)[a]	- -	- -	- -	- -	- -	- -	0.01		0.16	
Age (yrs.)[a]	- -	- -	- -	- -	- -	- -	39.54	(14.64)	36.58	(11.65
Illiterate (0/1)[a]	- -	- -	- -	- -	- -	- -	0.63		0.95	
Lactating (0/1)[a]	- -	- -	- -	- -	- -	- -	-		0.53	
Pregnant (0/1)[a]	- -	- -	- -	- -	- -	- -	-		0.30	
BMI	18.63 (1.49)	19.99 (1.89)	18.16 (1.55)	19.24 (1.92)	18.54 (1.49)	19.56 (1.93)	18.45	(1.43)	19.6	(1.80
BMIDIF1 (= Lean 1 - Surplus 1)	- -	- -	- -	- -	- -	- -	-0.47	(.80)	-0.75	(1.16
BMIDIF2 (= Surplus 2 - Lean 1)	- -	- -	- -	- -	- -	- -	0.38	(.83)	0.32	(1.10
N	139	166	139	166	139	166	139		166	

Table 5 cont'

Table 5:

Descriptive Statistics

Variables	Season 1		Season 2		Season 3		All Seasons	
	Mean	(Std. Dev.)	Mean	(Std. Dev.)	Mean	(Std. Dev.)	Mean	(Std. Dev.)
Children (<=6)								
Age (yrs.)	- -	- -	- -	- -	- -	- -	2.78	(1.84)
WAZ	-1.96	(1.68)	-1.84 (1.60)	- 2.70 (1.35)	-2.42 (1.44	- 2.49 (1.26)	-2.22 (1.37)	-2.38 (1.37)
WAZDIF1 (= Lean 1 - Surplus 1)	- -	- -	- -	- -	- -	- -	- -	-0.74 (.83)
WAZDIF2 (= Surplus 2 - Lean 1)	- -	- -	- -	- -	- -	- -	- -	0.21 (.54)
Mother's BMI	20.24	(2.04)	20.21 (1.63)	19.37 (1.97)	19.57 (1.66)	19.99 (2.09)	19.79 (1.55)	19.87 (1.89)
Mother's BMIDIF1 (= Lean 1 - Surplus 1)	- -	- -	- -	- -	- -	- -	- -	-.87 (1.37)
Mother's BMIDIF2 (= Surplus 2 - Lean 1)	- -	- -	- -	- -	- -	- -	- -	.62 (1.24)
N	85	78	85	78	85	78	85	78

* For all dichotomous variables, a "1" indicates the condition specified by the variable name; cases are assigned a "0" otherwise.

* Source breakdown for income earned in only the season specified (not of the cumulative income measure used in the regressions).

* Seasonal shares refer to each season's contribution to annual source income (not of the cumulative income measure used in the regressions).

* Includes pregnant and lactating women.

of household structure on female BMI. Among men, widowhood had a positive effect only in the lean season.

As a first step in examining the impacts of the seasonality of income flows (and income sources) on BMI per season, shares of household income were determined for each season.[9] The general finding that income levels and some of its sources affect women's nutritional status, while the timing of income flows (sometimes of certain sources) matters more for male nutritional status -- is replicated seasonally.

As possible determinants for BMI in Surplus 1, income per capita levels for that period alone, and the sources of that income, were included in the first season equations. The positive income level effect among women seen for year-round BMI did not appear when only Surplus 1 income was taken into account; but the income source effect that adult females from households relying more heavily on animal sales relative to crop production were significantly better off persisted. In addition, household reliance on livestock product VTO for larger share of incomes (again, vis-a-vis crop production) in this season was associated with higher female BMIs.

For the Lean 1 season, in the belief that income from the previous period and the current period's income jointly affect lean season BMIs (taken near the end of season Lean 1, which also encompasses the main harvest period), a cumulative, two-season income per capita measure was used. We were interested not only in the sources of this income over the two-season period, but the relative contribution, for each income source, of Surplus 1 in the two-season total (the "Seasonal Share" variables). Among women, those from households with higher two-season income per capita fared significantly better in the lean season. The source, but not the timing, of this income mattered: once again,

greater reliance on animal sales vis-a-vis crop production for "income" meant higher female BMIs. For men in season Lean 1, the timing of certain types of income generation mattered (see final block of income variables, "seasonal share" of each income type, which measures the relative contribution of each season to a income from a given income): the greater share of two-season crop income coming in the current season boosted lean-season male BMIs.

The relevant income measures for Surplus 2 BMI were the three-season total income per capita, and when it was generated -- Surplus 1 season, Lean 1 season, or Surplus 2 season (by the same logic used in determining appropriate income variables for season Lean 1). For income sources, the share of each income source type coming in the final season (Surplus 2) -- concurrent to the period during which BMI was measured -- was also included in the regressions. Among women, higher three-season income per capita <u>levels</u> meant higher third season BMIs, but the timing and source of that income did not matter. Among men, while income <u>levels</u> were, as in other seasons, unassociated with BMIs, timing was again important: the more income produced in the Lean 1 season relative to the Surplus 1 season, the better off were male adults of the household in the Surplus 2 season following on the lean season. And, larger shares of annual livestock product income generated in the Surplus 2 season (vis-a-vis the two previous seasons) boosted male BMIs after the early harvest (Surplus 2 season).

Several points emerge from this seasonal look at adult nutritional status. First, when nutritional status is affected by "income" levels, as in the case of sample females, it is income levels summed up over several seasons, <u>not</u> the income flow coming solely in the same season as BMIs are measured. This suggests that our Surplus 1 equation would be

improved if we had information on at least the "main harvest-to-lean period" season that preceded it. More work is needed to pinpoint precisely what the relevant income cycle is for policy purposes -- one full seasonal cycle prior to the season in question? The answer may differ from "abundant" to "lean" season, and the lag structures may vary within (as well as across) households -- for example, animal sales income could affect male nutritional status in the current season, and female in the next, as energy intake/expenditure effects of livestock's absence are felt. Answers to these questions will help determine the timing of appropriate policy interventions for optimal effect. Second, the timing of income seems to be more important for male than female nutritional status, while income source matters more for females. This may suggest women currently have more flexibility to adjust energy expenditure/intake associated with income-generation to the dictates of the season (since levels of income have an impact regardless of timing), but not the task (since source does matter, regardless of season), than men. If true, this would mean that policymakers focusing on male rather than female nutritional status would have to be more aware of the effect of an intervention's timing. Third, bolstering the above hypothesis, evidence suggests that male BMIs respond positively to higher current-season income generated from crops (in the Lean 1 season) and livestock products (in the Surplus 2 season) than previous-season income. In other words, for men, recent income is more useful than past income, perhaps conveying a short time horizon in the gains made vs. the energy expended to generate income among males. Longer term consequences of income generating activities, important to policymakers, are impossible to pinpoint with the data at hand. Animal sales, if done not out of asset strength but out of desperation, for example, could translate into

higher nutritional status only in the short term, and into lower BMIs as the household's productive base is eroded. One annual cycle may not be long enough to capture such effects.

Finally, two equations examining determinants of BMI changes across seasons -- the decline into the lean season, and the recovery thereafter -- were run. Results are reported in the last two sets of columns in Table 3. Regardless of gender, adults starting the annual cycle with a higher Surplus 1 BMI fell farther in nutritional status from Surplus 1 to Lean 1. Moreover, those who fell farthest from Surplus 1 to Lean 1 (a lower BMIDIF1), had larger "recoveries" from Lean 1 to Surplus 2.[10] The results show that age, already established as correlated with lower levels of nutritional status among adult females, worsens the deterioration of nutritional status moving into the lean season (Surplus 1 to Lean 1) only among men, and has no effect on its "recovery" from the lean season to after the first harvest (Lean 1 to Surplus 2). As expected, pregnant women lost significantly less weight during the period than did others. The only household structure variable to affect seasonal nutritional change was the gender ratio: in households where women composed a higher percentage of household adults, men weathered the decline into the lean season better.

For this measure of nutritional status change, as for previous measures of nutritional status, income levels proved to be important (and beneficial) only among women, with higher levels slowing the BMI decline going into the lean season, even though they did not affect the rebound from Lean 1 to Surplus 2. And, as in the case of nutritional status levels, timing of income from all sources, and from particular sources was more important for male than female nutritional status change. From Surplus 1 to Lean 1, current season (vs. previous season)

crop production value and animal sales were both associated with smaller BMI falls among men. In the "recovery" period from Lean 1 to Surplus 2, source of income was unimportant, but, once again, timing was important for males, but not females: a higher share of annual income coming in the current-period (Surplus 2 season), as opposed to Lean 1, boosted BMI recovery among adult males; higher income share generated in the Lean 1 season was, in turn, significantly more important in boosting male BMI recovery than was Surplus 1 season income.

B. *Seasonal Nutritional Status and Seasonal Swings among Children*

Similar sets of season-specific, and "decline" and "rebound" regression equations were estimated for children's nutritional status using weight-for-age z-scores. Results appear in Table 4.

Among children six years old or younger, the seasonal equations, like the year-round one, largely failed to hone in on determinants of girls' nutritional status. In every season (as in the year round equation), literacy of household head living in the same dwelling boosted the nutritional status of boys (but not girls), but didn't affect decline or recovery of nutritional status. Also regardless of season, older boys had worse weight-for-age z-scores, and age emerged as a strong determinant of seasonal decline (but not recovery) in nutritional status for both boys and girls, with older children's weight-for-age z-scores falling less going into the lean season (the association is non-linear in the Surplus 1 season and for the Surplus 1-to-Lean 1 season transition, as shown by the significant AGE^2 term).[11] As was the case with adults, children better off nutritionally in Surplus 1 experienced the largest drop going into the lean season. Echoing the year-round results, no household structure variable --

polygamous, dependency ratio, or sex ratio among adults -- was significant; nor was a measure of maternal BMI (previous- and current-season BMI levels, and magnitude of shift in mother's BMI leading up to the current season, were tested with no significant results; not all these results are reported).

Higher household income per capita (defined seasonally as in the BMI equations) translated into higher weight-for-age z-scores for boys in each season, and lessened the severity of the lean season decline for preschoolers of both sexes, but for some reason meant less of a post-lean season recovery for boys. In the Surplus 1 and Lean 1 seasons, boys' weight-for-age z-scores were higher in households where a greater share of income was derived from livestock product value, vis-a-vis crop value; for female preschoolers, such increased household reliance on livestock product "income," while not affecting nutritional status levels, did translate into less of a nutritional status drop from the Surplus 1 to the Lean 1 season. Female preschooler recovery was affected by income's timing and source: higher annual income share from animal sales (vis-a-vis crop output value) meant less of a nutritional status recovery (perhaps reflecting reduced access to livestock products); higher share of annual income generated in the current season (Surplus 2), however, meant improved nutritional recoveries.

CONCLUSIONS, POLICY IMPLICATIONS

This study from rural Ethiopia reveals gender differences in nutritional status and its determinants for both adults and children -- differences that fluctuate from the "abundant" to "lean" seasons of food

availability, and that have implications for the targeting, timing, and design of policy intervention plans.

First and foremost, children here are at risk year round -- much more so than are adults, and drastically more so in the "lean" summer months before the spring rain's harvest. While some evidence suggests that rising "income" levels and education of heads of household will boost boys' nutritional scores, few clues as yet point to what policy "levers" could be pulled to lift those of girls. Still, evidence suggests that, whereas nutritional status worsens among boys as they age, older boys are more able to sustain a stable nutritional level going into the lean season than younger ones.

Second, female adults are consistently better off than males, regardless of season. Still, male and female adults alike exhibit significant seasonal nutritional status declines between the initial and lean season (a finding that disappears once age/gender groups are categorized by income tercile), but the "rebounds" of their nutritional status in the final season of the cycle are not statistically significant. This and other findings, especially regarding the importance of the timing of income for nutritional status, suggests that interventions need to be timed so that their impact will be in "sync" with nutritional shortfalls, and help nutritional recovery. If replicated annually, this cycle of shortfall exceeding rebound would imply a downward spiral of nutritional status -- thus, factors affecting the "rebound" deserve policy attention.

Third, the household/individual/income factors examined here do a much better job of explaining female than male adult nutritional status, both seasonally and year round. Household structure variables such as dependency ratio and adult sex ratio didn't have far-reaching effects,

but they did affect at least one subgroup, in at least one season. Namely, more dependents per productive adult took a nutritional toll on adult females (but not males) in the Surplus 1 season, and proportionally more females per male adults in a household benefitted adult males going into the Lean 1 season. Moreover, being in a polygamous household had striking detrimental effects on adult female nutritional status in all seasons. Household sharing arrangements for agricultural production -- proportion of gross cropped area shared in, also had a negative effect only on adult female nutritional status, but again the effect spanned more than one season. The mechanisms behind how impacts differ for women vs. men need to be explored, but these variables suggest indicators to aid in targeting households with potentially nutritionally deficient adult females. Moreover, timing might be more important for the implementation of policies affecting factors that have seasonal nutritional impacts, than of those affecting factors that have stable, year-round effects.

Fourth, income links to nutritional status can depend on level, source, and timing of that income, and each dimension has a gender (and age) component. Higher household income levels (measured as household value of output in crops and livestock products, plus any income from animal sales or labor) mean improved nutritional status for women (and for boys), but not for men. Women benefit nutritionally as household income sources diversify away from crop production and into animal sales, and, in some seasons, livestock products. If these benefits are due to labor allocation by sex of livestock and crop activities, technology may have a role to play in easing this energy expenditure. Boys also benefit from a greater share of income from livestock products vis-a-vis crops, and there was some evidence that such reliance helped

girls weather the food-scarce season, dampening their nutritional declines during that period. If these benefits are due to accessibility of calories, policymakers would do well to promote sustainable livestock activities more broadly, possibly including encouragement of livestock markets at certain times of year, to aid nutritional status of vulnerable subgroups at other times.

Evidence on the timing of income generation suggests that the income earned (regardless of source) in the Lean 1 season goes the farthest in boosting three-season average nutritional levels for all intrahousehold subgroups, but is also important seasonally for men, boosting Surplus 2 season BMIs. For the Lean 1-to-Surplus 2 "recovery" period for men and girls, current season income means a more substantial recovery. Evidence also suggests that men's nutritional status is more sensitive to the timing of particular income sources than other subgroups inside the household. Crop production value in the Lean 1 season is important to that season's male BMI levels, and, in the Surplus 2 season, current-season livestock product value is linked with better-nourished males.

More generally, these findings on the gender- and age-specificity of the determinants of nutritional status, and especially its seasonal component, suggest caution in assuming that a policy instrument aimed at lifting household welfare will necessarily affect all intrahousehold subgroups equally, or any subgroup evenly throughout the annual cycle of seasons. Attention should be paid to household structure, income levels, income sources, and the timing of income sources as representing energy intake/expenditure "filters" for policy.

ENDNOTES

1. BMI, and these cut-off points, were chosen as indicators of chronic energy deficiency (James, Ferro-Luzzi, and Waterlow 1988). Recent research in Guatemala, however, suggests that the measure may need modification in certain developing country contexts to serve as a reliable indicator of chronic energy deficiency, and that the measures inability to capture proportion of fat in body mass may make it insensitive to some gender differences (Immink, Flores, and Diaz 1992). Adults over 18 years were chosen because the height measurements for non-adolescents were more reliable.

2. Weight-for-age, a medium term nutritional measure, was chosen to get an idea of the sample children's nutritional status history, while still monitoring nutritional status swings during the sample period. Children under six were chosen partly because comparison with a developed country distribution of child nutritional status is more reliable than for older children, and partly because, since children at this age are usually not yet part of the household labor force, their patterns of energy expenditure are less likely to be tied to type of household income generated.

3. Separate measures are reported for adults (individuals over 18 years old), and children (aged six years or younger).

4. To get "seasonal" nutritional status, an individual's BMI or weight-for-age z-score was averaged across the two consecutive measurements (taken at one-month intervals) constituting each season, if both were available; otherwise, the single available measurement was used. Work remains to be done to identify and correct any selectivity bias being introduced in this selection process, due to measurement error or attrition from the sample. Those "dropping out" because of measurement error need to be separated from those not measured -- and both groups examined more closely. Clearly, many of the reasons for "dropping out" seasonally or permanently could be intimately linked to nutritional status, most obviously, but not solely, in the case of dropping out due to death. Preliminary analysis suggests that those excluded from the sample do exhibit some significant differences from those included for some age/gender/physiological status groups in some factors expected to influence nutritional status, i.e., income per capita levels, timing of income flows, and source of income flows, and household characteristics such as ratio of dependents to working-age adults, and polygamy.

5. Females depicted here are neither pregnant nor lactating.

6. Total household "income" was calculated as the sum of "income" from four sources in each of three seasons over the period August 1990 - September 1991: 1) value of total output (VTO) for the crops accounting for the highest shares of household gross cropped area in the four peasant associations (a relatively limited geographic area) -- including maize, teff, sorghum, enset, yams, broadbeans, chickpeas, kidney beans, kale, peppers, and coffee; 2) VTO for the most commonly produced livestock products (milk, cheese, and butter); 3) animal

sales; and 4) wages (often the value of in-kind wages in food-for-work projects). To get VTO, each crop and livestock product was valued at an annual mean price for each Peasant Association in the Awraja, based on monthly market surveys as well as purchasing and sale information gathered monthly from survey households. Share of income from each source -- crop VTO, livestock products VTO, animal sales, and wages -- was calculated for subsequent analysis. All "income" measures are expressed per capita for each household.

7. An average of the seasonal z-scores.

8. And this difference in explanatory power was not solely attributable to the dichotomous variables for pregnancy and lactation, expected to be powerful in explaining variation in the nutritional status dependent variable.

9. For the purpose of allocating all annual income to each of the three seasons, each season's end was marked by the anthropometric measurements, and the following season began immediately thereafter.

10. This measure of BMI change, rather than BMI level, was included in the second equation to test whether magnitude of nutritional decline going into the lean season affected the magnitude of recovery.

11. AGE^2 was tested for significance in all equations (for adults and children) where AGE had a significant effect, and appears only in the equations where it was significant.

Chapter IX.37

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Chapter X.1

MOTHERS' AND FATHERS' INCOME CONTROL AND EFFECTS ON CHILDREN IN GUATEMALA

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INTRODUCTION

For the past decade, researchers have been finding increasing evidence in support for the hypothesis that women (mothers) tend to use income with different priorities from the way men use them. A substantial body of evidence suggests that these funds are more likely to be used to meet the immediate needs of children when women have control of the income. If, indeed, these findings are so consistent, we are left with a policy dilemma: should women be encouraged to work even more than they are already doing in order to improve the nutritional status of their children? We have ample evidence from many cultures that women are working many more hours than are men, and that their workloads increase with increasing numbers of children, whereas men's do not (McGuire and Popkin, 1990). One strategy is to encourage an increase in wage rates for women, and develop improved systems of child care. A second approach is to change the priorities that men have in spending to increase the proportion of their income directed to children's basic needs, as Bruce and Lloyd have recommended (1992). If we are attempt the second approach, we need to understand differences between men in their commitments to their children, and strategies for improving that commitment.

There is a tremendous need to determine the characteristics of fathers which influence their willingness to contribute high proportions of their income to child support. This paper will address this issue. However, in this study,

as in many investigations, too little information on fathers' ideas, beliefs, and attitudes were collected, and the available information is derived from the women.

This paper has two purposes: the first is to present evidence suggesting, as does Blumberg (1988), that the relative economic power of the woman in the household is associated with increased decision-making and improved welfare of children. The second is to test the hypothesis that the more committed a father is to the welfare of his children, the better the growth of those children. If the latter hypothesis is supported, then strategies to increase that commitment need to be explored.

The argument that income earned by mothers will be more important for children's well-being than will fathers' income was suggested in the 1982 WID position paper; "It is often from women's income, not men's, that the basic survival needs of families are met" [1, p. 3]. Yet the data to support this contention are far from adequate. Studies have not examined specifically how or why these differential effects occur. This paper uses a sample of 294 mothers and young children in a peri-urban community of Guatemala to explore patterns of income pooling, and to determine how strategies of mother's and father's income use are related to children's nutritional status. This sample is appropriate to address the question because both income generation and child undernutrition are common.

A number of studies have compared the nutritional status of children of working and non-working mothers in developing countries. Although several studies have shown positive associations of women's work and children's nutritional status, controlling for potentially confounding variables, they have not compared the effects of men's and women's income and contributions to child

nutritional status [2,3,4,5,6,7,8,9,10,11]. A growing body of evidence suggests that mothers are more likely to use their income to meet their children's basic needs [12, 13]. Johnson [14], for example, reported that among the lowest quartile of a national sample of families in the Dominican Republic, the mother's income was significantly associated with better nutritional status of young children, controlling for wealth variables. In the upper three quartiles, no differential effect of maternal income was found. Barbeau et. al [15] found in Panama that the mother's extra income appears to go to purchases of higher-quality foods. Whether the effect of the mother's income differs from that of the father's income has rarely been addressed, and the mechanisms for these relationships are not yet well understood.

Several explanations of why mother's income generation would benefit children more than father's have been advanced, and they overlap considerably. The decision-making approach suggests that as women earn more income, they have a greater amount of status in the household, and their higher status means that they are more able to influence decision-making [16]. Blumberg's [12] gender stratification model postulates that relative economic power is the most important of the major independent "power variables" affecting overall gender stratification. The greater a woman's economic power, the greater her control of life options. An explanation from psychological theory suggests that women are more likely to become attached to their children, and therefore to be more empathetic to their children than men. Therefore, they will be more attentive and responsive to their children's needs than will fathers [17,12], whether due to cultural norms or to the process of attachment.

Another possible explanation is that some fathers are more likely than mothers to spend money on personal goods, such as alcohol or cigarettes, which

don't help the family [12]. A few studies have claimed to have data to support this hypothesis [4] but most of the evidence has been anecdotal, like this comment from Alvarado:

"The problem some campesina women have is even worse. Not only do their husbands refuse to help, but they don't even support the family. They don't give her money to put food on her children's plates."

"When the men find work, they earn a few dollars a day. The campesino with better habits gives all his money to his wife; maybe he keeps 50 cents to buy cigarettes. The campesino with bad habits gives his wife less. If he earns $2.50, he gives her one dollar and keeps $1.50 for himself. If the woman complains and asks why she only gets one dollar while he gets $1.50, he says, "That's none of your business. I earned the money and it's mine to spend as I please." What can the woman say? If she still complains, she's asking for a fight. "

"That's why so many campesina women have to work. They fatten pigs or raise chickens, bake bread or sell tortillas in the market - anything to make a few pennies to feed the children." [18, p. 52]

The argument that women's income might be especially beneficial for children's health or nutritional status also requires that families do not pool incomes; unless mothers have certain responsibilities, and men have others, there could be little justification for a greater effect of maternal income. Again, anecdotal evidence from Alvarado illustrates one kind of non-pooling.

"Some of the women are sharp, though, and get money from their husbands without them knowing."

"Take my friend Zenaida. She waits until her husband is fast asleep. When she hears him snoring, she gets up very, very quietly and searches through his

pants pockets. Whatever money she finds, she takes. Then she crawls back into bed while the poor man is still snoring away."

"The next day he gets up, puts on his pants,and goes out to work in the field. He doesn't yet realize his money is gone. But when he comes home from work, he says, "Hey, did you take some money out of my pocket?"

"Are you crazy?" Zenaida asks. "Why would I look through your pockets?"

"You did, didn't you?" he asks, still not sure.

"Why? What happened?" she asks.

"I had some money I'd been saving up to buy some clothes,and it's gone," says her husband.

"You probably lost it when you were out drinking last night, " Zenaida answers. "It probably fell out of your pocket while you were drunk. Because I surely didn't take your money."

He's all upset because he lost the money. Meanwhile, Zenaida's in the kitchen, laughing with her children. "Hah. Your father says he was saving the money for clothes, but he wanted it to get drunk with. I fixed him. But don't you dare tell him, because with this money I can go to the market and buy you good things to eat." So the children keep their mouths shut.

I never did that to my husband, because I always worked. I had more money than he did. But lots of women do it. They tell me about it, and we have a good laugh. It serves the men right, we say." [18, pp. 52-53]

Although this anecdote is probably exceptional, it does provide a counter-example to the economic view that households pool resources and function as "utility-maximizing units motivated by stable, uniform preferences but constrained by pooled economic resources" [13, p. 67]. A number of studies have found evidence that families do not pool incomes. For example, Fapohunda [19]

studied 266 Yoruba households in Nigeria, and found that over 80% of households did not pool their incomes, that expenditures tended to be gender-specific, and that women did not tend to know about their husbands' economic affairs, nor did they tell their husbands about their own finances. Roldan [20], using a Mexican sample, found little evidence for income pooling. Folbre [21] argues that economists should utilize models from social science to explain what goes on within households.

It is misleading to compare the contributions of husbands and wives' incomes to children's well-being without controlling for confounding variables, or measures that relate both to nutritional status and the working status of the parents. For example, many studies have shown that working mothers tend to be poorer and less likely to be married than non-working mothers [6,7]. Poverty and marital status are often found to relate to nutritional status. Caretaking adequacy, child's birth order, and mother's education are other variables which have been found to be associated with nutritional status in children, and are probably associated with a mother's employment status. All of these variables should be controlled for in analyses.

Six hypotheses linking mothers' and fathers' incomes to children's nutritional status in a peri-urban area of Guatemala are tested:

1. Most families will not report pooling incomes.

2. The higher percent of family income women earn, the more control they have over decision-making about purchases.

3. Mothers will contribute a higher percent of their incomes to household expenses than will fathers.

4. For men, the amount of income contributed for household expenses would be a better predictor of child nutritional status than total income earned; this

difference would not be seen for women.

5. For men, the percent of their income contributed to household expenses would be a better predictor of child nutritional status than total income earned; this difference would not be seen for women.

6. The higher the percent of family income women earn, controlling for other factors, the better the child's nutritional status.

METHOD

Sample

The initial sample consisted of 302 families with children between the ages of 8 months and 47 months living in two adjacent peri-urban Guatemalan towns. Infants were not included because factors influencing growth are different during the infancy period. To be selected, each family had to have an "index child" within this age range. If the family had two children within this age range, the younger was selected as the index.

The research team attempted to gather a complete 20% sample of the two villages. Every fifth house was selected to be included in the sample from a map and an aerial photograph. If the residents did not have a child between 8 and 47 months, one of the adjacent houses was selected for inclusion in the sample, first from the right hand side, then from the left. Once a family with a child under four had been identified as a potential subject, every effort was made to include that family in the sample. Often surveys will miss families of working mothers because no one may be home at the time of the visit. For 10 families, after three visits the mother could not be located (3% of the families contacted). Another seven families with preschool aged children declined to participate (2% of the families contacted). Eight index children were dropped, four because they were out of the age range, and four for measurements of

anthropometric status which were out of the acceptable range.

Instruments and Procedure

Height and weight of all children in the family under 48 months of age were assessed using a Salter Scale, a horizontal infant board, and a tallimeter. The interviewers/anthropometrists were four Guatemalan teachers familiar with the town. Training was provided by the Institute of Nutrition of Central America and Panama (INCAP) on interviewing and assessment of nutritional status. Standardized trials with children in the local day care center indicated that the four were within acceptable levels of reliability on the anthropometric measures using a calculation of a ratio of percent agreement with the trainer and the trainee, developed by INCAP following World Health Organization guidelines.

Each woman was interviewed in her home regarding her working patterns, child care patterns, family relationships, feeding practices, and knowledge of child development. In most cases, she was not in the presence of her husband during the interview - particularly for the questions relating to intra-household relationships. Reliability of the interview was obtained by a) two people coding the same interview; and b) two separate interviews of the same subject. All interviews were recorded to check for reliability of questioning and coding. At least 85% concordance was required for all instruments. All forms were reviewed by the author upon completion and errors were returned to the interviewers for revisits when answers were not clear or were out of range.

In order to increase the reliability of the economic information, several separate questions concerning household expenses and household earnings were asked of the mother. Prior to asking women about their own income, they were asked how much money was spent per week on food and daily household needs like soap. They were then asked how much of that money they contributed (aportado)

to these expenses. Father's income and income and help from others were also asked. One check on the information provided was whether the total expenses per week were more than the family income, which was reported for each family member based on the frequency of pay (daily, weekly, etc.). Most of these figures were quite consistent. However, all of the income information about fathers was obtained from the mothers, who may not have known how much their husbands earned. None reported not knowing the husband's earnings if he was living in the household. However, for 20 women, their contribution to the household expenses could not be coded due to incomplete information.

Variables

Nutritional status. All height and weight measures were transformed into z-scores based on normative data from the United States (NCHS norms) [22]. This transformation provides an age and gender standardization, with a mean of 0 and a standard deviation of 1. Although one can question the relevance of US norms for a developing country population, they are widely used by the World Health Organization and provide a useful metric for comparing one child with another within a particular culture [23]. The three measures used were height for age, weight for age, and weight for height.

Economic variables. Ten different income measures were constructed. Four kinds of income variables were constructed for the mother and four for the father, and two were family summary measures. All were transformed into per capita measures based on nuclear family size, and are expressed as a per month figure. The family measures were 1) total family income from all family members, including help from children and others; and 2) total household expenses per month. The parent-specific measures were 1)total income earned by that parent; 2)amount s/he contributed to the household food budget; 3)percent of income s/he

contributed to the household food budget; and 4) percent of total family income which the parent earned (presumably a measure of economic control).

Family responsibilities. During the course of the interview, after the woman had developed some trust in the interviewer, she was asked several questions about her relationship with her spouse: whether she had to ask for an allowance, how he responded if she did ask, whether she had problems with her spouse, and whether she told her husband how much she earned. She was asked a single assertiveness question: if you think that you have the right to something, and do not receive it, do you ask for it, or wait and forget about it? Finally, she was asked who was responsible for purchases in seven areas: food, clothing, her personal effects, education, medicine, rent, and electricity/water.

Potential confounding variables. All of the variables used as controls for confounding (house quality, mother's education, marital status, age, gender and birth order of the child, adult and sibling help in child care) were derived from the interview with the mother, except for the quality of the house, which was observed by the interviewer. The House Quality scale was a sum of points indicating the quality of the walls, floor, and roof, ranging from 3 to 16. House quality was used as a control for wealth, since it is not the same as the income measure, but tends to capture variance in family wealth. House quality had a low but significant correlation with total income per family ($r=.24$, $df=300$, $p<.001$). The mother reported the number of years of school she passed, the parity of the child, whether she received help in caregiving from any of her children, and whether she received help in caregiving from another adult. Marital status was coded as either in a union, whether legal or consensual, or not currently in a union, which could be due to separation, divorce, widowhood, or desertion. Legal marriage and consensual unions were combined for these

analyses, and all fathers living with the mother were called spouses.

Analysis

The first phase of the analytic plan was to determine whether there was income pooling and to examine inter-correlations of income variables in order to address hypotheses 1-3. The last three hypotheses were addressed first through zero-order correlations of nutritional status with the ten income measures. Second, multiple linear regressions with each income measure entered, controlling for confounding variables [24] on the nutritional status measures were computed. Possible colinearities were examined.

RESULTS

Village Description

The town (actually two adjacent towns) is in an industrial area south of Guatemala City. A number of new industries have come into the area. Some residents work in these factories, and others take a 20-minute bus ride to Guatemala City to work on a daily basis.

The town itself has variations in wealth. There are many poor houses made of cane with dirt floors, interspersed with a few wealthier houses made of stucco with a mosaic floor, a truck parked outside, and a color television. Main roads are paved although most houses face onto dirt roads that become muddy puddles in the rainy season. The most common house is of stucco, with a metal roof and a cement floor, although 28% of the houses have dirt floors, and some houses have walls of cane, scrap wood, or plastic. Some houses have been divided into tiny rooms (apartmentos) that have sprung up to meet housing needs. The most common pattern of tenancy was renting. Rents ranged from 15 to 100 Quetzales per month, or about $6.00 to $40.00 per month. At the time of the study, a Quetzal was

equivalent to $0.37. The town residents were primarily wage-earners; only 15% of the families reported planting corn and beans. However, 42% raised chickens for eggs and an occasional meal. Characteristics of the Sample

The women in the sample were Spanish-speaking (99%). They averaged 3.23 children, and had nuclear family sizes of five members. Only 5% stated that they were single or widowed, although over twice that number (13%) reported that they were not with their spouses. Legal marriage is the most common arrangement (52%); however, 39% of mothers are in a consensual union. About 17% of the dual-headed families were living with parents.

Mean years of schooling was 4.02 years passed, but the range of education was non-schooled through 18 years of schooling, and 28% of the mothers were illiterate. Almost a quarter(23%) reported receiving help from older siblings with child care, and 36% reported receiving help from adults.

Patterns of work. Almost half of the mothers (45% or 133) earned some income during the past 12 months. Twenty-four percent of the working mothers worked at least 40 hours per week, 52 weeks of the year. One quarter (28%) of the workers were domestics, primarily ironing and washing on a daily basis for more wealthy patrons in the same town. Thirty-five percent were informal workers: door-to-door saleswomen, day-laborers in agriculture, and employed tortilla-makers. A third group (37%) worked in formal sector jobs, (e.g., factory work or sales clerk), had a trade (e.g., seamstress), or owned a small business (e.g., a store in their home).

The relationship between women's income and men's income within a family is shown in Table 1. Mothers were categorized into three groups: those who did not earn any income, those who earned less than half of the family income, and those who earned more than half of the family income. Fathers were also

Table 1

Cross-tabulation of Families by Percent of Total Income Earned by Mother and Percent of Total Income Earned by Father.

n = 294.

	Percent of income earned by Mother			
Percent of income earned by Father	No income earned	Less than 50% earned	More than 50% earned	Total
No support	18	1	22	41
Less than 100% support	21	97	13	131
100% support	122	0	0	122
Total	161	98	35	294

categorized into three groups: those earning 100% of the family income, those earning some, but not all of the family income, and those not contributing to the family (usually not living with the family). The two most common family patterns observed were the father working, and the mother earning no income (N=122), and both mother and father earning income, but the mother earning less than half of the income (n=97). In 41 cases (14%), there was no father support, but only in half of these cases did the mother earn over 50% of the family income. In the other half, the mother was supported by other family members.

Income. Table 2 shows the income per family member per month in Quetzales, and the expenses per family per month. The average income for all families (average 5 members) was Q278 per month, and the monthly food expenses were Q153. If rent were 50/month, this would leave on the average Q78 ($28) for all other

Table 2

Means, Standard Deviations, and Sample Sizes of All Income Variables per Capita by Month (in Quetzales)[a].

Variable name	M	Std dev	n
Total family income	62.8	70.5	293
Food Expenses	33.6	30.9	292
Fathers income	55.4	63.0	254
Mothers income	24.1	25.8	133
Fathers contribution	32.0	27.0	256
Mothers contribution	15.0	20.6	122
Percent of Mother's income contributed	53.4	39.2	113
Percent of Father's income contributed	61.1	26.5	254
Percent of family income Mother earns	39.6	30.8	133
Percent of family income Father earns	82.1	24.9	253

Note. [a] At the time of the study, 1 Quetzal = $0.37.

expenses, including medicine, clothes, transportation, and emergencies. Considering that a course of antibiotics for a child might cost Q20, one can see that many of these families have few reserves. Diets tend to be bland, unvarying, and with meat perhaps once a week. Tortillas, beans, and noodles are common fare. Sixty-five percent of families reported rarely or never purchasing processed food, such as mayonnaise.

Income Pooling

The hypothesis that income pooling would not be common was supported. 92% of dual-headed households, mothers reported that the father gave them a household allowance periodically. Most of these women (82%) reported that they did not have to ask for this money. Mothers were asked about the father's response if the money was insufficient and she needed more. The majority of fathers (66%) complied willingly; however, 18% of mothers reported that the father was unwilling to give more, and another 16% reported that the father became angry at such a request.

Women in a relationship with the baby's father were asked whether they, their spouses, or both were in charge of each of a series of seven standard expenditures: clothes, personal expenses, food, medicine, education, electricity/water, and rent. If an item were not purchased by that family, the category was missing (e.g., education expenses did not exist if no children were of school age). Among non-working women, food was usually (88%) the woman's responsibility. All other items except the mother's personal expenses were more likely to be the father's decision than the mother's. Education decisions were shared by 30% of the non-workers, but less than 20% of mothers reported that decisions in the other areas were shared.

It seems unlikely that spouses bargain explicitly in this culture.

Societal norms do not support straightforward requests. For example, when women were asked, "If you thought that you had the right to something and did not receive it, what would you do?" Eighty percent said that they would simply "forget it." As the quotes from Elvia Alvarado [1] illustrate, some women may use subterfuge to obtain money. In this sample, 41% of women reported that their spouses did not know how much they earned, which may be a strategy they developed to keep their income under their control.

Relation of income earning to decision-making

The second hypothesis, that the higher the percent of the family income the mother earned, the greater her control over decision-making was tested by comparing the amount she earned (no support, earned less than 50% of family income, and earned more than 50% of family income) with the degree of responsibility she had for each of the seven purchasing decisions. These percents and the Chi Square analyses are shown in Table 3. For all purchases except food, women with more income reported significantly more decision-making responsibilities than women with less income. The most marked differences are between women who earn less than 50% of the family income and those who earn more than 50% of the family income.

Percent of Income Contributed

The third hypothesis, that mothers would contribute a higher percent of their income to the household expenses than would fathers in the same family, was not supported. In 92 families both mother and father had contributed income to the family, and data were available on contributions. In these pairs, there was a marginal tendency for fathers to contribute a higher percent of their income than mothers in the same family (paired t-test=1.89, p=.06). Overall, fathers did contribute a slightly higher percent of their incomes (61%) than did mothers

Table 3

Cross-tabulation of Family Income Earned by Mother, Father, or Both, and Person Responsible for Decisions in Seven Expense Areas.

Expense area	Person responsible for decisions concerning expenses			x^2	n
	Mother (percent)	Father (percent)	Both (percent)		
Clothes					
No income	28	55	17	17.95**	271
Less than 50%	36	41	22		
More than 50%	60	14	25		
Women's Personal expenses					
No income	53	33	14	12.71**	274
Less than 50%	69	21	9		
More than 50%	75	7	18		
Food					
No income	88	7	5	3.22	275
Less than 50%	91	7	5		
More than 50%	82	3	11		
Medicine					
No income	34	55	11	21.30**	271
Less than 50%	37	44	21		
More than 50%	68	11	19		
Education					
No income	27	43	30	9.43**	145
Less than 50%	36	41	23		
More than 50%	48	9	43		
Light/Water					
No income	20	77	3	14.72**	213
Less than 50%	28	68	4		
More than 50%	56	31	12		
Housing					
No income	16	80	4	29.31**	233
Less than 50%	23	70	6		
More than 50%	58	21	21		

Note. **$p<.01$.

(53%). Both mothers and fathers contributed a higher percent of their incomes when there were more children in the home ($r(111)=.20$, $p<.05$ for mothers; $r(252)=.17$, $p<.01$ for fathers).

Effects of mother's and father's income on children's nutritional status

Although the study area is not particularly poor for Guatemala, children coped with frequent illnesses and undernutrition. One half of the children had colds at the time of the interview, and 20% had diarrhea, even though the interview occurred in the healthy (dry) season. According to the internationally recognized threshold for undernutrition of -2 standard deviations of National Center for Health Statistics norms [23], children generally were undernourished; 40% in height for age, 20% in weight for age, and 14% in weight for height.

Table 4 shows zero-order correlations of the ten per capita income measures with children's height for age, weight for age, and weight for height. Sample sizes vary depending on whether the correlation is with the mother's or the father's income. These two groups are not exclusive; when children have both a mother and a father earning an income, they will be represented in both correlations. These correlations show that not only total family income and total family expenses, but also mother's and father's income, contributions, and percent of total family income earned are related to the height for age and weight for age measures. The only exceptions are the percent of the mother's income she contributes to the food budget, and for height for age, the percent of the father's income contributed. These measures may indicate ways in which the family compensates for poverty; the poorer the family, the higher the percent of income the parent may give for food expenses.

Weight for height, which reflects the nutritionally important process of wasting, was unrelated to most income measures. It was, however, related

Table 4

Intercorrelations Among Income Measures (n's in parentheses).

	Variable Name	1	2	3	4	5	6	7	8	9	10
1	Total family income		.52**	.94**	.60**	-.32**	-.06	.61**	.41**	-.26**	-.17**
			(291)	(253)	(253)	(253)	(253)	(133)	(121)	(113)	(133)
2	Food Expense			.32**	.67**	-.06	-.18**	.54**	.66**	.14	-.00
				(253)	(256)	(253)	(252)	(132)	(122)	(113)	(132)
3	Father's income				.68**	-.31**	.23**	.35**	-.02	-.30**	-.29**
					(239)	(253)	(253)	(110)	(100)	(192)	(110)
4	Father's contribution					.01	.03	.65**	.31**	-.18[a]	-.05
						(239)	(239)	(112)	(101)	(95)	(112)
5	% Father's income contributed						.11[a]	-.02	-.15	.01	.27**
							(253)	(110)	(100)	(92)	(110)
6	% Family income Father earns							-.35**	-.44**	-.02**	-.65**
								(110)	(99)	(92)	(110)
7	Mother's income								.63**	-.14	.39**
									(113)	(113)	(133)
8	Mother's contribution									.24**	.32**
										(113)	(113)
9	% Mother ~~earns~~ contribution										-.01
											(113)
10	% Family income Mother earns										

Note. **p<.01. [a] p<.10.

significantly to the percent of the family income the mother earned.

Since zero-order correlations may simply reflect the effects of other correlated variables, the net effect of mother's or father's income were examined through multiple linear regression analyses. Variables controlled for were mother's education, house quality, age of the child in months, gender, birth order, whether there was child care help from siblings or adults, and presence or absence of a spouse. The marital status variable was not used for analyses of father's income, since all were in unions.

To test the fourth and fifth hypotheses, ten multiple regressions were performed on the each of the nutritional status indicators (30 analyses). For each regression, one income variable was entered and all potentially confounding variables were controlled for. Table 5 shows the significance of the model, percent of variance accounted for, the slope (b value) for income, and the significance level for the analysis of each of the ten income variables for each nutritional status indicator.

The fourth hypothesis was that father's overall income would be less related to the child's nutritional status than his contribution, whereas there would be no difference for mothers. This hypothesis was only partially supported. For weight for age, father's contribution was significantly associated with the child's weight for age, but his total income was not. On the other hand, for mothers, total income was associated with both height for age and weight for age, whereas the amount contributed was associated only with weight for height.

The fifth hypothesis was that father's overall income would be less related to the child's nutritional status than his percent of income contributed, whereas there would be no difference for mothers. This hypothesis was supported. The

Table 5

Correlations of Income Measures with Nutritional Status Indicators.

Income measures	n	Nutritional status indicators		
		Height for age	Weight for age	Weight for height
Total family income	293	.19**	.17**	.05
Food	292	.28**	.19**	.60
House	294	.21**	.14**	-.03
Father's income	254	.24**	.21**	.08
Mother's income	133	.31**	.26**	.09
Father's contribution	256	.28**	.23**	.06
Mother's contribution	122	.16[a]	.17*	.15[a]
% of Father's income contributed	254	.12	.17**	.11
% of Mother's income contributed	113	-.10	.03	.15[a]
% of family income Father earns	253	.17**	.17**	.05
% of family income Mother earns	133	.18*	.22**	.17*

Note. **p<.10. *p<.05. [a]p<.10.

percent of the father's income contributed was significantly associated with all three anthropometric measures, whereas his total income was unrelated to any of the measures. On the other hand, for the mothers, percent of income contributed was unrelated to any of the nutritional status measures, whereas total income was related to both height for age and weight for age.

These two hypotheses were also tested by entering the three income variables and potentially confounding variables into one regression for fathers, and into another for mothers earning an income. The three income variables entered were total income, contribution to household expenses, and percent of income contributed. Analyses of the inter-correlations of these items suggested that multicolinearity would not be a problem.

All models were significant. For fathers, the only income measure related to nutritional status was percent of income contributed, which was significant for weight for age ($b=.008$, $p<.05$) and weight for height ($b=.008$, $p<.05$). For mothers, none of the income measures were related to nutritional status when all were entered. Thus, the fifth hypothesis, that father's percent of income contributed would be a better predictor of children's nutritional status than his total income, whereas there would be no difference for mothers, was supported.

Income Control

The last hypothesis, that the higher the percent of the total family income the woman earns, the higher the nutritional status of the children, controlling for confounding variables, was tested with two multiple regressions. In the first, percent of family income earned by mother was entered after all confounding variables were entered. In the second, all of these plus the other three mother income variables (total income, amount contributed, and percent contributed) were entered.

Both models were significant for all nutritional status indicators. In both models, the percent of family income earned by the mother was significantly associated with all three nutritional status measures at or beyond the .05 level. In the regression with all income measures, only this measure was related to children's nutritional status ($F(1, 100)=5.95$, $p<.02$; $F(1, 100)=7.63$, $p<.01$; $F(1, 100)=4.58$, $p<.05$ for height for age, weight for age, and weight for height, respectively).

The same variable for fathers (percent of family income earned) was analyzed in the same way. When other income variables were controlled for, percent of family income earned by the father was unrelated to the child's nutritional status.

Characteristics of Committed Fathers

Table 4 presents correlations of the percent of income the father earns with other income measures, and Table 7 shows the correlations of the various economic measures with several measures of socio-economic status and family functioning: number of children, amount of time mother worked, stress level of the mother, and quality of the house. Fathers who contribute a higher percent earn less overall, and have wives who earn a relatively higher percent of the family's budget, if she works. There is no association between the percent that they contribute to the family pot and the amount of money spent on food.

Fathers who contributed a higher percent differed from others primarily in the number of children they have; the more children, the higher the percent of income contributed. This percent was unrelated to the mother's level of education (also correlated to the father's level of education) or to the quality of the house. Both of these analyses suggest that fathers who contribute a higher percent of their incomes are responding to family need. Our data do not

allow us to identify other characteristics of more committed fathers.

DISCUSSION

Six hypotheses concerning patterns of income pooling and the relationship of various components of income in the hands of mothers and fathers on children's nutritional status were tested. The results suggested that among these Guatemalan town-dwellers, income pooling is not common. Many purchases are seen as either mothers' or fathers' responsibility, and strategies for transferring income are explicit. Women tend to be non-assertive, and almost half did not inform their spouses about the amount of income they earn. It is possible that the bargaining strategies displayed by many of these mothers represent a type of power relationship described by Falbo and Peplau [25] as characteristic of some intimate relationships in the U.S. These authors found that when women in a relationship felt that they did not have much power, or ability to influence the course of decisions, they tended to use a strategy of non-confrontation. They would simply take actions without discussing them, and keep resources to themselves. It is likely that non-confrontation rather than explicit bargaining is being used by many of these mothers.

A second finding was that there was no significant difference in the percent of their income that mothers or fathers (in relationships with each other) contributed for family well-being. In fact, fathers contributed a higher percent of their income to the household budget. For both, the more children they had, the higher a percent of income they contributed. These data suggest that fathers in general are no worse at supplying their families' basic needs than are mothers.

A third conclusion was that the greater the woman's income in comparison

to the total family income, the more likely she was to have or share the responsibility for making decisions. The only exception was food purchasing, which appeared to be the woman's decision whether or not she worked. Some of these decisions can have immediate consequences for children. For example, only 34% of women without income reported making decisions about the purchase of medicines, whereas 68% of women earning over 50% of the income reported making decisions about medicine purchases. This information can help health workers target the most important change agent in the family.

Finally, the results suggested that different aspects of mothers' and fathers' income were important for children's nutritional status. For mothers, the amount that was earned was related to children's nutritional status, both alone and controlling for confounds. On the other hand, the amount of her income she contributed for food expenses and the percent of her income contributed were not predictive of children's nutritional status. If mothers tend to use their incomes for food, then variability from mother to mother in how much was contributed for food should be small. If all mothers tend to be contributing similarly, then amount contributed should be less important than the total income available for children's nutritional status which was, in fact, the case.

The most predictive of the mothers' income measures was the percent of the family income they earned; the higher the percent, the better nourished their children, controlling for confounding variables. This finding supports the hypothesis that as women's earning power in the family increases, children's welfare will also improve [12].

This finding is similar to other studies which suggest that, for children beyond the infancy period, the net effect of the mother's work on children's nutritional status is positive, when controlling for the family's wealth [5, 6,

7, 14]. Most of these studies also report that the women who work for income tend to be poorer than non-workers. Without the additional income from working, the children of these working mothers probably would have been more undernourished. Work by the mother probably protects children from the even more negative circumstances they would face without her work.

Blumberg [12] suspects that women's income tends to be used to enrich the diet, rather than to purchase basic staples. In the course of the interviews, mothers told us that the money they made was for extra food for their children, for medicine, for eggs or milk, and for the more expensive foods that are particularly valuable for weaning-age children's growth [26]. High caloric density foods, such as milk, may be more critical for children's growth and development during the 9-24 month weaning period, when children need a richer or calorie-dense diet than either earlier or later [7]. Thus the positive effects or additional income are likely to be larger during this age period.

In contrast to the mothers, for fathers overall income was unrelated to children's nutritional status, controlling for confounding variables. In fact, using the slopes, an increase of one half of a standard deviation in height for these children would requrire $11.40 additional funds if earned by the mother, but $166 if earned by the father given the current living circumstances.

The amount the father contributed and, even more, the percent of his income which he contributed was significantly associated with his children's nutritional status. These findings are congruent with the hypothesis that the father's investment of his income toward meeting the basic food needs of his family may be a critical factor in determining his children's growth adequacy.

The fact that the percent of the father's income contributed, rather than his total income, was related to his children's nutritional status, raises the

question of whether some fathers are more attentive to the basic needs of their children than are others. If contributing a higher percent of income to the family food expenses reflects fathering commitment, these data are consistent with the hypothesis that fathering commitment is good for children. The question of how fathers use their income is rarely addressed outside of anecdotal evidence of alcoholism or misuse of family funds [20, 4]. The recent work by Hoddinott and Haddad [27] using data from Cote d'Ivoire is an exception, and demonstrates the significance of the mother's control of income for expenditure patterns. However, in general the absence of good data on this topic is remarkable, considering the wealth of information on the effects of mother's work on their children. One of the difficulties in this study is that the fathers' income data were obtained from the mother. No information was obtained on non-productive use of income (e.g., for alcohol) for either parent. The lack of information from men about these issues needs to be remedied. A development strategy to improve child welfare which not only provides opportunities for women's employment, but also encourages father's commitments to their children is needed.

In a recent literature review, Engle [28] summarized a number of studies which examined factors determining fathers' commitment to their children, and theories which could explain these patterns of commitment. Major factors identified were cultural norms, the father's economic ability to support the family, the strength of the father/mother bond, and psychological factors within the father, possibly a function of his childrearing. The notion that mothers are genetically programmed to attend more to their children than fathers has not received support; a substantial body of literature suggests that although fathers in most cultures do not perform much child care, they can attend as warmly and responsively to their children as can mothers.

Cultural factors are important; for example, in Cameroon, it is acknowledged that the father's role is one of providing his children with lineage connections; the mother's responsibility is to provide food and economic support for both father and children. He has little contact with young children. However, the cultural ideal is in rapid flux. Many countries report emerging beliefs that fathers should be involved much more in child care and nurturing than previously, although actual change is slow [28].

Other economic and cultural changes have resulted in less father responsibility. For example, in Chile, rapid changes in mass media and institutions have resulted in a rapid and dramatic alternation in the traditional authoritarian male role in urban, lower class families (see 28 1993 for details). The result has been men's flight from their responsibilities for child and family support.

Lack of father responsibility has been associated with poor income-earning power in the US, and in the rapidly urbanizing areas of developing countries. Father commitment has also been found to be associated with the quality of the husband-wife relationship; for some men, the responsibility to children and the relationship with the children's mother is a "package deal". The increasing rates of divorce and children born out of wedlock are increasing the number of children raised by single mothers dramatically. The culture with the highest rate of father/infant interaction ever reported (the Aka pygmies) appears to be based on a subsistence system which requires husband and wife to cooperate and communicate in order to obtain the foods needed by hunting (Hewlett, 1992, cited in 27).

A few programs have attempted to increase father responsibility, both among intact families and with non-resident fathers. Whereas the majority have been

in developed countries, efforts are beginning in Jamaica, Lesotho, Bangladesh, Colombia, and probably other Third World countries. The more successful efforts have increased the amount of father/child contact, and the amount of child support payments of absent fathers for their children. These strategies have included: 1) support groups in which fathers share their experiences with other men, and learn how to parent; 2) economic programs to provide men with improved skills for earning a living; 3) skill training, particularly prenatally, which assists fathers in knowing how and when to work with children; 4) education in schools for future parents (less successful, not really tried); 5)mass media presentations of new models for fathers; 5) intensive opportunities to take responsibility for the care of children. Fathers who have had the experience of extended caretaking of infants tend to become more aware of their needs, even if the reason for their extended caretaking may have been economic rather than a desire to increase their caretaking roles. Often mothers play a large role in helping fathers to be more involved. Becoming "attached" to a child, which occurs during early caregiving, appears to be a significant factor in long-term father/child bonds.

We still know very little about factors which influence fathers' commitment to children. Despite the messages of the "new fatherhood", and mass media images of committed and involved fathers, the reality is that fewer fathers are taking responsibility for the support of their children than have in the past. Social movements are demanding more of men at the same time as their status in the home is being undermined. Programs to increase father commitment are in their infancy. Many programs directed toward children, such as breastfeeding promotion, have not included fathers. The idea that there may be substantial differences among fathers in their commitment to children is not well accepted. This is an area ripe for investigation, and too long ignored.

Table 6

Slopes of Adjusted Income[+] Variables (Per Capita/Per Month) on Nutritional Status.

Income measures	n	Nutritional status indicators					
		Height for age		Weight for age		Weight for height	
		$R^{2(a)}$	b	$R^{2(a)}$	b	$R^{2(a)}$	b
Total family income	293	.19**	.0003	.16**	.0007	.06*	.0008
Food expenses	292	.18**	.006*	.16**	.003	.06*	-.0006
Mother's income	133	.26**	.013**	.23**	.011**	.10	.005
Father's income	254	.19**	.001	.17**	.002	.08**	.001
Mother's contribution	122	.18**	.007	.19**	.010	.16*	.010*
Father's contribution	254	.19**	.005	.17**	.005*	.08**	.003
% of Mother's income contributed	113	.17*	-.003	.16*	-.0003	.14	.002
% of Father's income contributed	254	.22**	.008**	.21**	.009*	.09**	.004*
% of family income Mother earns	133	.29**	.013**	.28**	.013**	.13*	.007*
% of family income Father earns	253	.21**	.007*	.19**	.007**	.08	.002

Note. [+]Adjusted for age of child, Mother's education, house quality, birth order, gender of child, sibling help with child care, and adult help with child care. [(a)]Signigicance of the model. *$p < .05$, **$p<.01$.

Table 7

Correlations of Selected Income Measures with SES Indicators

Income Measures	Number of Children	Mother's Education	Hours of work	Stress Score	House Quality
Father's income per person per month	-.31**	.45**	-.02	-.11a	.28**
Mother's income per person per month	-.40**	.43**	.33**	-.13	.28**
Amount father gives per month per person	-.34**	.48**	.10	-.11a	.37**
Amount mother gives per month per person	-.27**	.28**	.40**	-.20*	.23*
Percent father gives per month per person	.17**	-.04	-.03	.08	-.12
Percent mother gives per month per person	.20**	.00	.25**	.05	-.10
Percent of total family income mother earns	-.08	-.06	.34**	-.04	-.09

Notes: sample sizes are in Table 5 for each income variable. Data for mothers' income is only presented for women who worked (N=133). Data for fathers is presented only for couples with a resident father (N=254).

Chapter X.33

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Chapter XI.1

FEMALE HEADSHIP IN THE DOMINICAN REPUBLIC: ALTERNATIVE DEFINITIONS AND IMPLICATIONS FOR FOOD CONSUMPTION AND NUTRITION

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Female headship of households is widely recognized to be on the increase in developing countries (Buvinic and Youssef, 1978; Buvinic, Lycette, McGreevey, 1983). The significance of this trend has received considerable attention in the past decade. This attention is due in part to the assumption that female headed households in poor countries are economically stressed and nutritionally vulnerable to a greater degree than households headed by men. At the same time, it is widely asserted that female-headed households manage their resources differently, because, it is argued, women place a higher priority than men on basic needs such as food and health care; and female heads have the opportunity to enforce these priorities in the allocation of household resources. Review of existing empirical literature reveals, not surprisingly, that the situation is somewhat more complicated than that. The economic and welfare implications of female headship depend on the cultural setting and on a wide variety of other factors.

Furthermore, the very concept of female headship is an elusive one. Historically, censuses and surveys have implicitly allowed the respondent to define headship. Typically these questionnaires simply

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begin the list of household members with the question, "Who is the head of this household". Respondents are not asked to explain their basis for selecting a particular individual. But for analysis of the differential economic conditions and resource allocation of female and male headed households, the definition of headship is critical. Recent research has demonstrated that the consequences of female headship depend on the type of female-headed household in question (Kennedy et al., forthcoming.)

Implicit in the hypothesis that female headship alters household consumption patterns in favor of nutrition and other basic needs is the assumption that female headship carries with it increased control over decisions. This is reasonable, but not necessarily true. The process of household decisionmaking is complex and not well understood. Where no adult males are present in the household, women by definition are in control of all household decisions, unless a male family member living outside the household exercises control. But where headship is defined in terms of economic contribution, for example, the degree of decision-making power conferred by a woman's economic contribution to the household is likely to be determined by cultural norms and by how that contribution is perceived, as well as by the size of the contribution.

The second implicit assumption is that increased female decision-making power automatically translates into a higher priority placed on food and other basic consumption needs. This is plausible, since women are most often directly responsible for the care of children and therefore perhaps more aware of their needs. Not every study has

supported this assumption however. (See Horton & Miller, n.d.)

One serious problem in attempting to test these assumptions regarding the effects of female headship on expenditure and consumption patterns and on children's welfare is that female-headed households are often different in many respects from their male-headed counterparts, and it is difficult to distinguish the effect of these differences, from that of headship per se. The present study finds that FHH have distinctly different age/sex composition and different income sources. These differences may account for any observed differences in expenditure and consumption patterns and in child welfare.

The present study uses data from the Dominican Republic to explore the relationship between headship as defined by survey respondents and headship according to selected alternative definitions. It seeks to describe female and male-headed households according to these different definitions, and to examine and test the assumptions of economic vulnerability and differing expenditure patterns of these different household types. The consequences of female headship and its associated household characteristics for consumption, dietary adequacy, and children's nutritional status are investigated.

1. Methods

1.1 Source of Data

The data for this study came from a nationally representative household income, expenditure and food consumption survey conducted in the Dominican Republic from January through November 1986.[1] Data were

collected for a period of a week in each household. Food consumption was measured at the household level; no individual food consumption data were collected. Economic status of the households was measured by average per capita monthly expenditure including the value of food from unpaid sources. Expenditure is widely recognized to be a more accurate measure of economic status than income because it fluctuates less than income and because respondents are more cooperative in reporting expenditures (Rogers, 1987). Households were assigned to expenditure quartiles and deciles based on the national distribution of per capita total expenditure. Income shares by source were calculated based on the household's reported income, including the value of food consumed from unpaid sources.

Calorie and protein consumption were estimated from the one-week household food consumption data.[2] Caloric and protein adequacy were estimated by comparing consumption levels with age- and sex-adjusted nutrient requirements of the household.[3] Information on guests eating in the household was not available.

A follow-up study on the same sample households conducted approximately six months later collected information on the heights and weights of all children ages six and under, along with information on the children's morbidity in the past two weeks, and the child's principal caretaker.[4] These data were used to calculate children's nutritional status by anthropometric criteria: height for age and weight for height.[5]

1.2 Definitions of Headship

In the survey, household composition was measured with reference to the individual defined by the respondent as the household head. No definition was offered by the interviewers other than the question, "Who is the head of this household?" One purpose of the present analysis is to see whether it is possible to determine what might be the empirical meaning of this self-definition of headship. To explore the question, three alternative ways of categorizing households in terms of women's roles were tested.

One possibility considered was that households might define themselves as female-headed only in cases where no adult male was present to fill the role of head. According to this "Absent Male" definition, households were categorized as female headed only if they contained no males between 18 and 60 years of age (inclusive). Note that this definition is not symmetrical. Households defined as MHH by this definition may contain adult women, while FHH contain no adult men.

Another way of looking at headship is in terms of the relative economic contribution of members. For the purposes of this study, a reference woman in each household was identified, who was either the self-defined household head if this person was female, or the female spouse of the self-defined head if male. Then two definitions of female headship were tested based on the role of the reference woman as major earner: if she contributed 50 percent or more of household earnings ("Major Earner"), and if she contributed, through her earnings, 50 percent or more of total household income from all sources, including those other than wages ("Major Income Contributor"). The four

definitions of headship considered in this paper are: (1) Self-Defined; (2) Absent Male; (3) Major Earner; (4) Major Income Contributor. Table 1 summarizes the four definitions related to headship explored in this study.

Table 1--Percent of households defined as female-headed by the definition at the top which are also female-headed by the definition at left

	Self-defined	Absent male	Major earner	Major income contributor
Self-defined	100	63.3	63.2	71.2
Absent male	52.4	100	46.9	47.0
Major earner	42.1	45.4	100	98.0
Major income contributor	17.5	14.7	51.2	100
N	1,400	1,402	1,060	1,243

2. Overlap Among Definitions

Table 1 shows the percentage of female-headed households (FHH) by each definition which are also female-headed according to all the other definitions. The most striking thing about this table is how imperfect the overlap among definitions is, except (of course) for those which must overlap by definition. None of the alternative definitions proposed in this paper accurately reflect a household's own self-definition of female headship. Only about half of self-defined female-headed households have no adult males present; this means that about 48% of self-defined female-headed households do contain adult males -- possibly grown children or the elderly father of the female head. Similarly, in fewer than half the self-defined female headed households (42%) is the reference woman a major earner, and in far fewer is she the major income contributor.

Nonetheless, a household defined as female headed by any one of our alternative definitions is far more likely to be female-headed by another than are households in the general population. Only six percent of households have the reference woman as a major income contributor, for example, but 17.5% of self-defined FHH fall in this category. Only 21% of households in the population have no adult male, but over half the self-defined FHH are in this situation. Clearly, then, both the household composition definition and the female work role definitions of headship capture important components of what causes households to define themselves as female-headed. There is no way to determine what respondents themselves had in mind when identifying the household head. Unlike some other cultural settings, the Dominican Republic is a country

in which women's work is not uncommon. About 42% of households have a reference woman who works in some type of market production. Of these, 70% have women who work for wages, the rest working in their own or their families' businesses. Even among households with working women, though, only 14% have the reference woman as the major income contributor, and only 29% have the woman as the major earner.

3. Socio Demographic Characteristics of Female-Headed Households

3.2 Economic Stratus

It is often asserted that female-headed households are more subject to economic stress than joint- or male-headed households, because women are disadvantaged in their access to jobs as well as in their access to education and in rates of pay. In this study, the measure of economic status is per-capita expenditure level, with expenditure including the value of food (but not other goods) received free of charge as gifts, transfers, or pay in-kind.

Using this measure, the results (not reported here) are unequivocal. Self-defined female-headed households are no more likely than other households to fall into either the lower or the higher economic classes. Households with no adult male are also evenly distributed among the per capita expenditure quartiles. This is surprising, since one might assume such households have by definition fewer earners and thus lower earning potential than households with males, but these households derive their income largely from sources other than earnings.

According to the Major Income Contributor definition, female-headed households are more prevalent in the higher per capita

expenditure quartiles. In the Dominican Republic, apparently, women's work is associated with improved economic status, presumably because of the additional earning power. These results are not altered if the sample is restricted to households containing children under 12 years.

3.3 Household Composition of Female and Male Headed Households

Female and male-headed households differ in terms of their demographic make-up.

3.3.1 Self-Defined

Self-Defined FHH are about one member smaller than their male-headed counterparts. This difference in size is larger (1.5 members) in poor households. The FHH have fewer adult males (not surprisingly), and also fewer children and infants. We had thought that possibly FHH would cope with their economically vulnerable status by incorporating more non-relatives and extended family members into the household, but there is no difference between FHH and MHH at any income level in the number of distant relatives or non-relatives living with the household. FHH have fewer economically active members, since they have fewer members overall. But the proportion of household members who work is also significantly lower in FHH. This is consistent with the fact that FHH receive a higher proportion of income from unearned sources.

3.3.2 Absent Male Households

Households with no adult male present are almost two members smaller on average than those with adult males present. They contain,

of course, significantly fewer males aged 12-60, but also significantly fewer females in this age range, as well as fewer infants and children. These households contain significantly more elderly members, including the household head. Self-defined heads of household in Absent Male FHH (note these may be male or female) are close to 10 years older (54.4 compared with 45) than in households where there are adult males, and these heads are significantly less likely to have a spouse living in the household, possibly because they are widowed (though this information was not available). There is no difference in the number of extended family members and non-relatives living in Absent Male households versus those with adult males present. The percent of dependent members is significantly higher in Absent-Male households.

3.3.3 Major Earner and Major Income Contributor

In households where the reference women is the major earner, there are fewer members (by slightly more than one person). There are fewer male adults in such households, which probably explains in part why female earnings are proportionately higher. There is no difference in the number of adult females, elderly, non-relatives or distant relatives, suggesting that FHH do not depend on expanding their households in order to be able to work outside the home; but there are significantly fewer infants and children, suggesting that the presence of small children inhibit women's ability to work.

3.4 Sources of Income

Female and male headed households, are about equally distributed

among per capita expenditure classes, but the sources of household income are radically different in the two types of household. The categories of income considered in this section are wages (earned income), business income, and income from farm sales, from rent (of rooms or houses), from pensions and social security, from interest and dividends, and from transfers. Transfers are simply gifts of cash which in the case of the Dominican Republic are usually payments from family members living away from home. Income from friends or neighbors providing cash support to a household in need is also considered transfer income. Wages are distinguished from other earned income because wages are paid to an individual in the household, and are a function of the time and skills of that individual. Business and farm income are also earned, but often these sources cannot be directly associated with one particular household member.

In addition to these cash income sources, the imputed (local retail price) value of income from food produced and consumed at home, and from food received as gifts, is reported. Home-produced food is a significant source of income in rural areas; gifts of food are quite important among households in the lowest quartile.

3.4.1 Self-Defined

Female-headed households are far more dependent on gifts and transfers than are male-headed households. Transfers of money from outside the household represent more than one-third of income in Self-Defined FHH, compared with about six percent in MHH. The difference is even greater in higher-income households, suggesting that

transfers more than other sources make the difference for FHH in the economic status they achieve. Wages are a far more important source of income in MHH than in FHH, though this difference is not significant in the lowest quartile.

Farm sales are significantly more important as an income source in MHH due to the fact that FHH are disproportionately urban. (In Absent Male households, which are disproportionately located in rural areas, there is no difference in the proportion of farm income between households that do and do not have adult males, in spite of the difference in available family farm labor. This fact tends to confirm that geographic rather than household composition differences are responsible for the lower proportion of farm income in self-defined FHH.

3.4.2 Absent Male

Wages are far less important, and transfers far more important as income sources among households with no adult male present. As with self-defined FHH, the differences are greater in the highest expenditure quartile.

Consistent with the observation that household heads are almost ten years older in Absent Male FHH, income from pensions is significantly more important where no adult male is present. The difference in the proportion of pension income is not significant in quartile 1 but is very significant in the highest quartile. This suggests that the availability of pension income may be one factor responsible for these households' higher income. Households with a history of stable, formal-sector employment, those most likely to have

pensions, are also most likely to be those in the higher income brackets to begin with.

3.4.3 Major Earner and Major Income Contributor

In households where the reference woman earns 50% or more of all wage income, wages are significantly less important as a source of income than in households where she earns proportionally less. This difference is greater in higher-income households. In households where a woman earns the majority of earned income, income from transfers and from farm sales is significantly higher. This suggests that it is easier for women to achieve "Major Earner" status where total earnings are lower. These differences are much greater in higher income households. In lower income levels, none of the differences (in earnings, transfers, or farm sales) is significant at the 5% level. By contrast, wage earnings are a far more important income source in households where a woman earns 50% or more of total household income. This is reasonable, since by definition these households include only those where wages (from anyone) constitute more than half of all income. Since wages are a more important income source in urban areas, it is not surprising that these households derive significantly less of their income from farm sales and consumption of home-produced food.

4. Expenditure and Consumption Patterns of Female Headed Households

4.1 Description

4.1.1 Expenditure Patterns

One of the most widely repeated assertions regarding women-headed

households is that their expenditure patterns differ from those of male-headed households. In particular, it is often argued (eg. Blumberg, 1979) that in FHH, a higher proportion of household resources is devoted to basic needs such as food and health care. The reasons cited relate to women's closer connection with, and therefore greater awareness of their children's well-being. The significance of this issue for policy is that, in cases where the argument is upheld, development programs which put resources in the hands of women may result in a greater impact on nutritional status and health. Conversely, programs which raise household income at the cost of shifting its control away from women may have the unintended effect of mitigating the degree to which the additional income contributes to household members' well-being and fulfillment of basic needs.

4.1.1.1 Food Consumption Expenditure

These data from the Dominican Republic do show some differences between FHH and MHH in their expenditure patterns, but these differences are rather inconsistent, and they do not in general support the contention that households headed by women have a higher preference for spending on food.

Among self defined FHH, food expenditure is, on average, no different from that of MHH. By most of the definitions tested in this paper, FHH are disproportionately urban. One would, therefore, expect to see higher, rather than lower cash expenditure on food in these households, since unpaid sources of food are less available in urban areas. The value of unpaid food does not affect these results.

These results are consistent with those for Absent-Male FHH. There are no differences between Absent Male FHH and MHH in the proportion of either cash expenditure or total consumption devoted to food.

In households where the reference woman accounts for half or more of the earned income, there is no difference in proportion of cash expenditure on food. The proportion is slightly (not significant) lower among FHH in the bottom quartile and slightly (not significant) higher in the top quartile. However, there is no difference on average between FHH and MHH in food consumption as a proportion of total consumption; in the lowest quartile, consumption of food (in value terms) is significantly lower in FHH.

Among households defined in terms of Major Income Contributor, the proportion of both cash expenditure and total consumption accounted for by food is significantly lower in FHH than in MHH, on average and in the lowest quartile. Female headship by this definition is quite uncommon, and the numbers are small. Nonetheless, the results are consistent.

4.1.1.4 Schooling

School expenditures are of policy interest because they represent investment in the human capital of the next generation. The differences observed in expenditure on schooling are most likely due to life cycle stage of the households, however, rather than to different priorities in MHH and FHH. Among Self-Defined FHH, school expenditure is no different than in their male-headed counterparts. School expense is lower in Absent Male FHH, no doubt because of the older heads and fewer children in these households. By Major Earner and Major Income Earner criteria,

no difference in school expense was observed.

4.1.2 Food Consumption Patterns

Food expenditure and food consumption as a proportion of total expenditure and consumption respectively, do not show pronounced or consistent differences based on headship. Where significant differences are observed, it is in MHH where food represents the larger share of consumption. However, it is possible that food expenditures are devoted to different types of foods in MHH and FHH, such that similar levels of expenditure obtain different levels of nutrients. To explore this issue, we looked first at the proportions of dietary calories obtained from certain food sources. Then we looked at the differences between MHH and FHH in terms of the calories and protein obtained for one peso of expenditure on food. (This calculation included purchased foods only.) These results are shown in Table 2.

The results suggest that FHH tend to purchase foods with the consumption patterns of relative luxuries, such as meat, chicken, and fish, and other foods from animal sources (including dairy products and eggs). Self-defined FHH obtain a significantly higher proportion of their dietary calories from the meat group (including chicken and fish), and from all animal sources. These differences, while not large, are significant in both the lowest and the highest expenditure quartiles. The proportion of calories from the inexpensive starchy staples (roots, tubers and plantain) is lower in these FHH. In Absent Male FHH, proportion of calories from animal sources is also higher than in MHH. This difference is (surprisingly) greater in the lowest quartile,

in which both the meat group and milk products provide a greater proportion of calories in the FHH.

In households distinguished by headship defined in terms of major earnings contribution, there are no significant differences between FHH and MHH in dietary patterns, except that rice and beans provide a greater proportion of calories in MHH. In FHH, the proportion of animal calories is higher, but not significantly so ($p=.1$). A similar pattern is observed among households distinguished by major income contributor: MHH obtain significantly more calories from rice and beans, while FHH obtain more from meat and all animal sources.

Apparently households in which it may be assumed that women have a greater influence on consumption patterns show a preference for higher quality foods (quality as culturally, not necessarily nutritionally defined), while households in which males may exercise more influence prefer calories which provide greater dietary bulk.

Given that FHH obtain a higher proportion of their calories from relatively more expensive sources, it is in FHH that lower levels of calories and protein are obtained per peso of expenditure, where differences exist. (See Table 2.) This is the case for calories purchased per peso by Absent Male FHH in the lowest quartile, and for protein and calories purchased by Major Income Contributor FHH.

These results for FHH defined by women's work roles may possibly be explained by the higher time constraints on women in such households. The time dimension is critical to working women, and perhaps they are trading off convenience in purchase or preparation against finding less expensive food sources. This explanation, however, would not apply in

Table 2--Calories and protein obtained per peso of expenditure, by male- and female-headed households (all definitions)

	All households			Quartile 1			Quartile 4		
	Male head	Female head	P	Male head	Female head	P	Male head	Female head	P
Self-defined									
Calories/peso	1,192	1,174	.5187	1,470	1,380	.1556	986	956	.5655
Protein/peso	26.84	26.81	.9614	31.69	31.11	.6341	23.28	22.70	.5086
Absent male									
Calories/peso	1,195	1,152	.1728	1,483	1,284	.0057	973	998	.6570
Protein/peso	26.89	26.56	.5770	31.81	30.37	.2958	22.92	23.93	.2777
Major earner									
Calories/peso	1,176	1,118	.1318	1,460	1,340	.1846	969	954	.8189
Protein/peso	26.68	2,589	.2653	32.03	30.42	.3535	22.69	22.81	.9168
Major income contributor									
Calories/peso	1,203	1,055	.0068**	1,460	1,317	.2525	990	887	.2862
Protein/peso	26.95	2,507	.0582*	31.51	29.22	.3334	23.23	21.51	.2844

Absent Male households. Another possibility is that women place a higher priority on the perceived quality and taste of the diet, and so purchase relatively more expensive foods when they control the budget.

Calorie consumption is often used as a marker of overall dietary adequacy in food consumption surveys. However, a number of studies (Sigman et al., 1989; Golden, 1988; Dwyer et al., 1982; Kemmer, 1989) have shown that the amount of food of animal origin in the diet may be an important determinant of nutritional status in both children and adults, even if calories are adequate. Thus the observed pattern of expenditure in FHH, in which the calorie efficiency of food expenditure is traded against greater consumption of animal foods, may be nutritionally desirable.

4.1.3 Household Dietary Adequacy

Dietary adequacy in this study was estimated by calculating the caloric and protein content of all food consumed in the household or prepared at home for consumption outside.[9] Average daily consumption of calories and protein was estimated and then compared with the number of adult-equivalent units in the household. Adult-equivalents were computed separately for calories and protein.

Table 3 shows daily calories and protein consumed per adult-equivalent unit, and the same consumption as a percentage of WHO/FAO recommended consumption levels, for MHH and FHH by each definition. The results are inconsistent. Self-defined FHH, on average and in the lowest quartile, achieve lower levels of calorie and protein

adequacy than MHH. The differences are large and statistically significant. However, no such differences are observed among Absent Male MHH and FHH. In Major Earner FHH, caloric consumption adequacy, (but not that of protein) is significantly above that of MHH. This is surprising, because such households spend proportionally no more on food than do MHH; they do not obtain higher levels of nutrients for their expenditure.

Average levels of adequacy are informative, but it is also useful to know whether the differences in average intake bring substantial numbers of households into the "at-risk" category, below 75% of recommended intakes. Female-headed households, both Self-Defined and by the Absent Male definition, are significantly more likely to fall into the high-risk category for both protein and calories. In the case of Self-Defined FHH the differences are highly significant in the lowest quartile as well, despite the fact that, for Absent Male FHH, average intakes showed no significant differences by headship. Even though average calorie intake is higher in Major Earner FHH, there is no difference in the proportion of households falling into each adequacy category.

In the highest quartile, there are no significant differences in caloric or protein adequacy between male and female-headed households by any definition, suggesting that at high income levels, constraints on food consumption are loosened and that the behavioral factors implied by headship are less important.

Table 3--Caloric and protein intake per adult equivalent unit, and percent of recommended levels, by headship (all definitions)

	All households			Quartile 1			Quartile 4		
	Male head	Female head	P	Male head	Female head	P	Male head	Female head	P
Self defined									
Calories/ad. eq.	2,612.24	2,419.32	.0027	2,425.23	1,971.32	.0013	2,787.70	2,767.84	.8861
Caloric adequacy (percent)	113.58	105.19	.0027	105.44	85.71	.0013	121.20	120.34	.8861
Protein gms/ad. eq.	58.76	52.87	.0004	51.85	43.36	.0118	65.87	62.61	.3739
Protein adequacy (percent)	111.92	100.71	.0004	98.76	82.59	.0118	125.46	119.26	.3739
Absent Male									
Calories/ad. eq.	2,545.49	2,645.75	.1595	2,299.01	2,314.91	.9219	2,768.70	2,833.94	.6601
Caloric adequacy (percent)	110.67	115.03	.1595	99.96	100.65	.9219	120.38	123.21	.6601
Protein gms/ad. eq	57.63	56.10	.4065	49.10	51.45	.5408	65.95	61.61	.2670
Protein adequacy (percent).	109.77	106.86	.4065	93.52	98.01	.5408	125.62	117.35	.2670
Major earner									
Calories/ad. eq.	2,480.81	2,649.48	.0460	2,176.79	2,286.51	.5688	2,715.04	2,876.84	.3262
Caloric adequacy (percent)	107.86	115.19	.0460	94.41	99.41	.5688	118.05	125.08	.3262
Protein gms/ad. eq.	56.47	58.69	.3270	47.87	51.38	.4831	64.42	62.61	.6880
Portein adequacy (percent)	107.57	111.79	.3270	91.19	97.37	.4831	122.70	119.26	.6880
Major income contributor									
Calories/ad. eq.	2,561.86	2,487.04	.5378	2,341.91	2,088762;779.632,846.70.7911				
Caloric adequacy (percent)	111.39	108.13	.5378	101.82	89.11	.2875	120.85	123.77	.7911
Protein gms/ad. eq.	56.92	57.23	.9207	50.37	45.23	.4446	64.67	62.71	.7657
Protein adequacy (percent)	108.43	109.02	.9207	95.94	86.15	.4446	123.19	119.44	.7657

4.2 Multivariate Results: Food Expenditure and Food and Nutrient Consumption

4.2.1 Analytic Methods

To explore the differences between MHH and FHH, it is essential to control for the systematic differences already known to exist between them. In the Dominican Republic, FHH are not disproportionately low-income, but, depending on the definition used, FHH are smaller, with fewer infants and children; household heads are older; (in the case of Absent Male households, a full 10 years older); in some cases the dependency ratio is higher, and in some the number of economically active members lower. By self-definition, and by definitions relating to earnings, FHH are disproportionately urban. Furthermore, FHH have very significantly different sources of income from MHH. In particular, Self-Defined and Absent Male FHH get far less income from earnings, farming, and home-consumed food, and far more from transfers than MHH. Households in which women's wages are a significant income source (Major Earner and Major Income Contributor FHH) get far more of their income from earnings, and less from other sources than MHH by these definitions.

To the extent that these factors affect food expenditure, food consumption, and children's nutritional status, a simple comparison of male and female headed households may be misleading, if the results are interpreted in terms of men's and women's bargaining power and consumption preferences.

In order to control for these variables, a series of regression analyses was performed, with food expenditure and calorie and protein

consumption (adjusted for age/sex composition, but measured at the household level) as the dependent variables. The basic model was as follows.

$$LNFOOD = +B_1\ LNPCEXP + B_2\ LNPCEXP^2 + B_3 STONE + B_4\ P + B_5\ AUTOPCT + B_6\ FARMPCT + B_7\ TRANPCT + B_8\ EARNPCT + B_9\ STRATUMj + B_{10}\ HHSIZE + B_{11}\ HEADAGE + B_{12}\ HIGHED = B_{13}\ ECACT + B_{14}\ LCADERAT + e$$

where

LNFOOD = Food expenditure in pesos per month per household (logarithmic form)

LNPCEXP = Per capita total expenditure in pesos per month, including the value of food consumed from unpaid sources (log form)

STONE = A measure of inflation calculated based on prices for a basket of goods in each month in each cluster. This variable is introduced so that the expenditure and price variables represent real rather than nominal values

P = A vector of prices for the ten most important foods in the Dominican diet. These are: common rice, sugar, red beans, milk, vegetable oil, pasta, plantain, chicken, beef, and yucca (cassava)

AUTOPCT = Percent of household real income (including the value of food consumed from unpaid sources) derived from home-produced and consumed food

FARMPCT = Percent of household real income derived from farm sales (crops, animal products, animals)

TRANPCT = Percent of household real income derived from transfer payments

EARNPCT = Percent of household real income derived from wages

STRATUMj = A vector of dummy variables representing four of the five strata in the survey sample. The reference case is the capital, Santo Domingo. The other strata are:

Stratum 2 = Other urban areas

Stratum 3 = Frontier

Stratum 4 = Rural cane-growing and livestock-producing regions

Stratum 5 = Other rural areas, mainly the rice growing regions

HHSIZE = The number of persons present full time in the household

HEADAGE = Age (in years) of self-defined household head

HIGHED = Years of formal education of the most highly educated member of the household

LCADERAT = The ratio of the number of adult-equivalents (based on FAO/WHO recommended caloric intake) to persons in the household.

This variable is a measure of the caloric requirements of the household, controlling for household size. This ratio approaches 1.0 if more members are adults. (It could conceivably exceed 1.0 if all household members were pregnant or lactating women, but of course this was not observed.)

A similar equation was estimated using LCALPA, the natural log of daily calories consumed per adult-equivalent, and LPROPA, the same for protein.

These equations were estimated to determine which variables are significant determinants of the dependents (food expenditure, calorie and protein consumption), before introducing the headship variables.

Model 2 adds to the basic model a dummy variable for female headship, which has the value of 0 if the household is male-headed, and 1 if it is female-headed by the definition in question. In addition an interaction term of female-headship with expenditure (INTFHEXP) is introduced to see if, controlling for income level and for headship, income is used differently with respect to the three dependent variables in FHH.

The log log quadratic form was chosen for the total expenditure variables because it appeared to offer the best fit with the data. Food

expenditure and food consumption increase at a declining rate with rising household income. Expenditure elasticity is a measure of the degree to which food spending or food consumption vary with changes in total household expenditure (our proxy for income). Specifically, the expenditure elasticity of food spending measures the percentage change in spending which would result from a one percent change in total expenditure. Similarly, the expenditure elasticity of calorie consumption measures the percentage change in calories consumed as a result of a one percent change in expenditure. This form allows the expenditure elasticity of food spending, and of demand for calories and protein to vary with income level. The interaction term with female headship in Model 2 permits the elasticity to vary by headship as well. Use of the logarithm is due to the fact that as income rises, it takes larger absolute increments of income to have an equal effect on consumption.

4.2.2 Food Expenditure

Without accounting for headship, the level of food expenditure is quite significantly affected by several variables which are associated with headship. Food expenditure levels are positively affected by the proportion of income from transfers, and (marginally significant at $p = .06$) from earnings. Consumption of home produced food reduces food expenditure, since, all else equal, home production reduces the need to purchase food. Number of members naturally raises household food expenditure. The number of economically active household members (controlling for household size and per capita expenditure level) shows

a negative association with food expenditure, possibly because a household which requires more members working to achieve the same level of income is, in real terms, worse off than households with fewer working members.

The introduction of the female headship variables adds very little explanatory power to the regression. Neither the dummy variable for female headship nor the interaction term with expenditure is significant for any definition of headship except the Absent Male definition. Absent Male FHH show lower food expenditure on average (that is, the coefficient of the dummy variable for female headship is significant and negative) but additional income is marginally significantly more likely to be devoted to food ($p = .069$). However, the additional explanatory power of the regression, as measured by the R^2, is extremely small. These results suggest that it is not possible to separate the effects of female headship, if any, from the effects of those characteristics associated with female headship, which do affect food expenditure. Once known differences between MHH and FHH are controlled, headship itself provides little additional information.

It does appear that in households where the reference woman accounts for 50% of wage or total income, transfer income is more likely to be used for food expenditure, as indicated by the significant, positive coefficient of the interaction term between female headship and the percent of income from transfers. These terms are not significant in the regressions based on other FHH definitions. Major Income Contributor FHH, though, also appear to devote more of earned income to

food, though in this model the coefficient of the FHH dummy variable is significantly negative. This possibly supports the idea that wage income earned by women is disproportionately devoted to food, but one should not make too much of these relationships either way. The magnitude of the negative effect of female headship on food expenditure is about the same as the positive effect of female headship on the use of earned and transfer income for food. Further, none of these variables adds very much to the explanatory power of the regression, compared to the basic model which includes no headship information.

When the same regressions were run separately for MHH and FHH, the differences between them in their determinants of food expenditure were significant for Self-Defined, Absent-Male, and Major Earner ($p = .01$) and for F. Earns Wages ($p = .05$). In Self-Defined MHH, responsiveness of food expenditure to changes in total expenditure is noticeably higher than in FHH (elasticities of 1.40 versus 1.13 at the population mean of per capita expenditure). That is, MHH appear to increase their food expenditure more in response to a change in total expenditure (our proxy for income) than FHH.

In contrast to the Self-Defined households, Major Earner MHH seem to be much <u>less</u> responsive to changing income than FHH; Major Earner FHH are <u>more</u> likely to respond to increasing household income by increasing their food expenditure. Once again, this may tend to support the hypothesis that females devote their own earnings to food.

4.2.3 <u>Calorie and Protein Consumption</u>

The dependent variables discussed in this section are average

daily calorie and protein consumption per adult-equivalent, measured at the household level, based on seven consecutive days of dietary recall. Although the measures are adjusted for age/sex composition of the household, they are not measures of individual intake.

The results of the estimation of Model 1, shown in Table 4, indicate that the household's per capita expenditure level is a highly significant determinant of calorie and protein consumption, as are certain food prices. These variables are not systematically different between MHH and FHH. Several variables observed to be different in MHH and FHH are also observed to be significant determinants of nutrient consumption. Consumption of home produced food, higher in MHH by most definitions, is significantly positively associated with both calorie and protein intake; income from farm sales, also higher in MHH, is positively associated with calorie consumption. Transfer income, much higher in FHH, is negatively associated with protein consumption. This means that, at any given expenditure level, if more of household income comes from transfers, protein intakes will be lower.

The number of economically active members (controlling for

Table 4--Results of the estimation of model 1 for household food expenditure

Headship defs:	Dep. var: Log of cal. consumption			Dev. var: Log of prot. consumption		
Independent variables	B	Beta	Sig. T	B	Beta	Sig. T
Per capita expenditure	1.2298	1.7966	.0000	1.2735	1.6873	.0000
Per capita expenditure squared	-.0930	-1.2398	.0000	-.0923	-1.1167	.0000
Stone index of inflation	.0016	.0213	.5775	-.0000	-.0000	.9976
Rice price	.2704	.0717	.0579	.4279	.1029	.0053
Sugar price	-.1738	-.0748	.0696	-.2304	-.0900	.0253
Bean price	-.0429	-.0237	.5303	-.0607	-.0304	.4081
Milk price	.0123	.0067	.9031	-.1162	-.0576	.2839
Oil price	-.3154	-.0861	.0303	-.1914	-.0474	.2214
Pasta price	-.1368	-.0367	.5537	.0260	.0063	.9166
Plantain price	-.0374	-.0305	.4641	-.0455	-.0337	.4076
Chicken price	.1790	.0391	.3278	.0623	.0123	.7514
Beef price	-.3353	-.1378	.0113	-.3720	-.1386	.0089
Yuca price	.0325	-.0227	.6878	.0339	.0215	.6969
Percent of income from home-produced food	.0054	.1409	.0000	.0029	.0694	.0358
Percent of income from farm sales	.0018	.0998	.0163	.0010	.0530	.1902
Percent of income from transfers	-.0001	-.0415	.3131	-.0019	-.0910	.0235
Percent of income from wages	.0000	-.0207	.6777	-.0001	-.0593	.2206
Other urban	-.0074	-.0073	.8786	-.0318	-.0284	.5406
Frontier	-.1556	-.1198	.0801	-.2458	-.1716	.0101
Sugar cane/livestock	.1565	.1274	.0248	.0054	.0040	.9427
Other rural	.0234	.0196	.7105	-.0843	-.0639	.2135
Household size	.1217	.1478	.0005	.1130	.1243	.0039
Age of self-def head	.0018	.0585	.0517	.0016	.0493	.1096
Highest education in household	-.0013	-.0125	.7137	.0065	.0550	.1022
No. ec. active members	-.0109	-.0335	.3479	-.0183	-.0511	.1423
Adult-equivalent ratio	-.5432	-.1506	.0000	-.7431	-.2610	.0000
Constant	3.8445	--	.0000	.2053	--	.7377

R^2 - .72509 Sig. F - .0000 - 927

Adj. R - .71652 F - 84.59036

household size), lower in Self-Defined and Absent Male FHH and higher in the other FHH, is significantly negatively associated with per capita food expenditure (after income level is controlled), but shows no significant association with calories and protein consumed per adult-equivalent. The adult-equivalent ratio is highly significant and negative for both calorie and protein consumption, suggesting that it is harder for households of a given size and income level to achieve calorie and protein adequacy as these nutrient needs increase. Controlling for this ratio, household size is significant and positive: the more members, the higher the level of macronutrient adequacy achieved. Recall that FHH are smaller than MHH, with fewer infants and children (whose nutrient needs are low), by all definitions tested. This suggests that, controlling for per capita income, additional members represent a productive resource for households, possibly because of their work in home-based productive tasks and perhaps also because of economies of scale in consumption. Thus FHH may achieve lower levels of nutrient adequacy in part because of their differing demographic composition.

4.2.3.1 Self-Defined

In the Model 2 estimates, in which a dummy variable for female headship is introduced, only the variable for Self-Defined FHH is significant in altering calorie consumption. According to these parameter estimates, controlling for all the other variables included in this model, self-defined female headship is very significant and positive. The magnitude of the effect of this variable (indicated by

the standardized Beta coefficients) is exceeded only be the expenditure variables. A similar effect is observed for protein consumption: all else equal, Self-Defined FHH has a higher level of protein adequacy. However, and this is an important caveat, female headship significantly reduces the degree to which additional income is devoted to additional calories or protein. The interaction term of female headship with expenditure is highly significant and negative. At any given expenditure level, the expenditure elasticity of demand for calories and for protein is lower in FHH. This effect is large enough to more than cancel out the positive effect of female headship. (That is, this model separates the effect of female headship into two components. Taken together, the net effect on calorie and protein adequacy appears to be negative.) At the population means of per capita expenditure, the expenditure elasticity of demand for calories is 0.43 for MHH and 0.29 for FHH. At the level of the poorest quartile, the figures are .53 for MHH and .39 for FHH. Results are shown in Table 5.

4.2.3.2 Absent Male

In the estimation of Model 2 using a dummy variable for Absent Male headship, headship does not show up as a significant determinant of calorie adequacy, nor does it significantly alter the expenditure elasticity. (The coefficient is negative, but not significant.) It is quite significant in its effect on protein consumption, however, with the effects being similar to those for Self-Defined headship: the

Table 5--Results of the estimation of model 2 for self-defined MHH and FHH, for calorie and protein consumption

Headship defs:	Dep. var: Log of cal. consumption			Dev. var: Log of prot. consumption		
Independent variables	B	Beta	Sig. T	B	Beta	Sig. T
Per capita expenditure	1.3592	1.9856	.0000	1.4480	1.9185	.0000
Per capita expenditure squared	.1028	-1.3707	.0000	-.1056	-1.2774	.0000
Female head x Per capita exp.	-.1372	-.6047	.0012	-.1873	-.7487	.0000
Female headship	.5709	.5543	.0030	.7812	.6879	.0001
Stone index of inflation	.0022	.0289	.4489	.0096	.7965	.9976
Rice price	.2661	.0706	.0607	.4239	.1020	.0053
Sugar price	-.1751	-.0754	.0662	-.2352	-.0918	.0212
Bean price	-.0389	-.0215	.5677	-.0528	-.0265	.4681
Milk price	.0297	.0162	.7672	-.0908	-.0450	.3985
Oil price	-.3276	-.0895	.0239	-.2090	-.0518	.1784
Pasta price	-.1588	-.0426	.4916	-.0060	.0015	.9807
Plantain price	-.0472	-.0385	.3556	-.0593	-.0439	.2780
Chicken price	.1652	.0361	.3652	.0403	.0080	.8365
Beef price	-.3463	-.1423	.0086	-.3872	-.1443	.0061
Yuca price	-.0368	-.0257	.6482	.0277	.0176	.7481
Percent of income from home-produced food	.0056	.1455	.0000	.0031	.0740	.0247
Percent of income from farm sales	.0017	.0983	.0187	.0001	.0509	.2099
Percent of income from transfers	-.0000	-.0165	.6983	-.0013	-.0604	.1447
Percent of income from wages	-.0000	-.0177	.7222	-.0001	-.0576	.2319
Other urban	-.0001	-.0001	.9885	-.0223	-.0200	.6652
Frontier	-.1435	-.1104	.1057	-.2272	-.1586	.0168
Sugar cane/livestock	.1593	.1297	.0216	.0088	.0065	.9052
Other rural	.0265	.0221	.6730	-.0796	-.0603	.2368
Household size	.1082	.1314	.0024	.0998	.1098	.0110
Age of self-def head	.0019	.0614	.0401	.0017	.0509	.0954
Highest education in household	-.0018	-.0166	.6263	.0056	.0477	.1542
No. ec. active members	-.0057	-.0174	.6261	-.0130	-.0362	.2965
Adult-equivalent ratio	-.5840	-.1620	.0000	-.7465	-.2622	.0000
Constant	3.4059	--	.0000	.3733	--	.5542
R^2 - .32646	R^2 - .36453		N - 942			
Adj. R - .30581	Adj R^2 - 18.70447		N - 94			
F - 15.80472	F - .34504					
Sig F - .0000	Sig F - .0000					

coefficient of the dummy variable for female headship is positive, but the interaction term with expenditure is negative, suggesting that households containing adult males start at lower levels, but are more likely to devote increases in income to increasing protein consumption. This is noteworthy because, as we shall see below, the protein density of the household diet appears to have a positive effect on children's health, indicated by its negative, significant relationship with days of morbidity.

4.2.3.3 Definitions Related to Women's Earnings and Market Work

None of the dummy variables for headship defined in terms of the reference woman's earnings and market work shows a significant effect on calorie or protein consumption. The variables which do show a significant impact are those already observed to be significant in Model 1: the proportion of income from home-produced and consumed food has a consistently positive effect on calories and protein; the proportion from farm sales is consistently positive, and significant for calories but not for protein. The proportion of income from transfers shows a consistently negative relationship with calories and protein, which is statistically significant in only two of the model estimations (results not shown here).

These results are useful in interpreting the simple comparison of mean calorie and protein consumption per adult-equivalent in MHH and FHH. It appears that the significant differences observed according to the Major Earner definitions, may in fact be due to the systematic differences in household composition, location, and income sources, and

not to headship per se. This suggests either that headship by this earnings - related definition does not imply greater control over decision making, or that greater decision-making power by women does not necessarily result in increased nutrient consumption.

4.2.3.4 Men's and Women's Earnings

A model investigating the independent effects of men's and women's wage income on calorie and protein consumption found neither the percent of income from men's wages nor the percent of income from women's wages showed a significant influence on calorie or protein consumption, after the effects of other factors are controlled.

4.2.3.5 Effect of Headship on the Use of Income From Earnings and Transfers

A model testing the interaction of the female-headship dummy variables with proportion of income from earnings and transfers also proved to be statistically insignificant for all definitions of headship and for both calories and protein.

5. Nutritional Status of Children

Our interest in food consumption pattern and dietary adequacy stems from a concern about the welfare consequences of female headship. The underlying question is whether female headed households manage their resources differently, so that the same endowment results in different welfare outcomes for members.

In this study, data are available on the nutritional status of

children under age six, as measured by anthropometric status: height for age and weight for height. These measures are commonly used to assess nutritional status in populations, although it is widely recognized that dietary adequacy, morbidity, activity, and genetic factors interact to produce a particular growth outcome (UNACCSCN#7). Height for age (HAZ) is generally considered an indicator of long-term nutritional adequacy. Weight for height (WHZ) is an indicator of short-term nutritional status; low WHZ scores indicate the child is excessively thin. Anthropometric measurements were taken about six months after the income, dietary intake, and household composition data were collected. We are assuming that dietary adequacy and economic and headship status reflect relatively long-term conditions, so that the relationship between headship and income at one time and nutritional status some months later will still be meaningful.

5.1 Comparisons of Nutritional Status in MHH and FHH

In fact, the results, shown in Table 6, are quite striking. Although by several measures female-headed households obtain lower levels of calories and protein, and more of such households fall into high-risk categories of dietary adequacy, children in such households show achieved growth which is no worse, and in a few cases significantly better than their male-headed counterparts. In the one case (that of FHH by the Major Earner definition) where FHH consumed more calories and

Table 6 Anthropometric Status of Children, Aged Six and Under, in a Male and Female-headed Household (All Definitions)

Headship Definition	All Households			Quartile 1			Quartile 4		
	Male Head	Female Head	P	Male Head	Female Head	P	Male Head	Female Head	P
Self Defined									
Height/Age	-.97	-.98	.9715	-1.30	-1.29	.9402	-.49	-.91	.22
Weight/Age	-.59	-.64	.6228	-.99	-.84	.4295	-.01	-.51	.11
Weight/Height	.06	-.02	.3752	-.21	-.02	.2099	.44	.07	.19
Absent Male									
Height/Age	-1.01	-.81	.1337	-1.31	-1.26	.8049	-.56	-.58	.97
Weight/Age	-.65	-.41	.0420	-1.03	-.67	.0731	-.09	-.14	.86
Weight/Height	.02	.15	.1724	-.26	.18	.0062	.39	.31	.97
Major Earner									
Height/Age	-1.00	-.88	.4414	-1.34	-1.04	.4064	-.61	-.49	.77
Weight/Age	-.63	-.60	.8234	-1 00	- 68	.3053	-.10	-.03	.85
Weight/Height	.04	-.04	.5251	-.19	.01	.4120	.40	.41	.99
Major Income Contributor									
Height/Age	-0.98	-.91	.7255	-1.36	-.52	.0802	-.58	-.42	.74
Weight/Age	-.60	-.60	.9773	-.97	-.56	.3336	-.13	.24	.39
Weight/Height	.05	-.01	.7361	-.15	-.26	.7420	.35	.70	.37
F. Earns Wages									
Height/Age	-.96	-.99	.8458	-1.30	-1.29	.9499	-.59	-.51	.79
Weight/Age	-.57	-.67	.3124	-.91	-1.04	.4950	-.22	.18	.12
Weight/Height	.08	-.05	.0917	-.11	-.28	.2420	.24	.69	.05
F. Works									
Height/Age	-.99	-.93	.5654	-1.27	-1 30	.8438	-.66	-.42	.37
Weight/Age	-.60	-.61	.9573	-.88	-1.06	.3002	-.22	.07	.22
Weight/Height	.06	.001	4630	- 09	-.28	1589	.29	.50	.33

protein per adult equivalent, there is still no difference between MHH and FHH in the achieved growth of children. Recall, though, that Major Earner FHH were no less likely to fall into the high-risk adequacy category for calories or protein.

In Self-Defined FHH, where caloric and protein adequacy is significantly lower than in MHH, anthropometric status of children is no different by any measure, neither in the whole population nor in low-income households.7

In households with no adult male present, children actually appear to have superior nutritional status by some measures. In low-income households, children in Absent-Male FHH have significantly higher weight-for-height. This is similar to results reported in Johnson and Rogers (forthcoming). There we suggested that in the absence of adult males who may (for a number of possible reasons) command a higher proportion of the food resources of a household, food may be more equitably distributed among household members according to nutritional need. It is also possible that the higher proportion of animal food in the diets of FHH may be related to the achievement of better growth outcomes for the absolute amounts of calories and protein consumed.

Differences in available calories and protein at the household level do not automatically result in comparable differences in the nutritional status of individual members. (Compare, for example, Garcia and Pinstrup-Andersen, 1990). The process of allocation among the individuals is, obviously, one factor which is critical to the outcome.8 The fact that male and female-headed households achieved similar nutritional outcomes for their children in the face of usually lower

levels of food availability suggests that the needs of children may be met in a variety of circumstances. Possibly the lower levels of available food in FHH are disproportionately directed to children, compared with the larger quantities in MHH. Thus, these higher levels of household food consumption may be indicative of the household's priorities in meeting the somewhat larger perceived food needs of the male heads.

5.2 Nutritional Status by Headship With Other Factors Controlled

As with food expenditure and food consumption, to understand how headship affects nutritional outcomes it is important to see whether the effects of headship can be explained by the various characteristics associated with MHH and FHH. If headship proves insignificant in predicting nutritional outcomes once the characteristics associated with headship are controlled, we cannot assert that headship does not matter; an alternative interpretation is that headship may operate on nutritional status through these intervening variables.

5.2.1 Analytic Methods

Nutritional status was measured in terms of height for age and weight for height, expressed as standard scores. The age variable which appears in these equations is the age of the child at the time of the household interview. For this reason, a dummy variable for the age of highest risk of morbidity due to ingestion of dirty non-food items (about 9 months to 2 1/2 years) was computed using age 6 months to 2 years. This is a rough approximation, since the time between the

household interviews and the child-level data collection was variable.

The analytic approach used here is to estimate a model to predict children's nutritional status, and then add to the model variables representing female headship, to see whether they represent a significant influence after controlling for other factors. The basic model to predict nutritional status is the following.

$$\begin{matrix}\text{HAZ} \\ \text{WHZ}\end{matrix} = + \; B_1\,\text{LCALPA} + B_2\,\text{PROTDENS} + B_3\,\text{ILLNESS} + B_4\,\text{AGE} + B_5\,\text{HIRISK} + B_6\,\text{MOMED} + B_7\,\text{HHSIZE} + B_8\,\text{NKIDS} + B_9\,\text{CADEQRAT} + B_{10}\,\text{STRATUM} + E$$

Where

HAZ = Height for age (standard score)

WHZ = Weight for height (standard score)

LCALPA = Average daily calories per adult-equivalent consumed in the household

PROTDENS = Grams of protein per 100 calories consumed (household level).

Protein density was used because protein consumed is so highly collinear with calories consumed.

ILLNESS = Total days of illness from diarrhea, fever, and/or respiratory infection in the 14 days prior to the child-specific interview.

AGE = Age of child in years

HIRISK = A dummy variable equal to 1 if the child was between 6 months and 2 years of age when the first (household) interview occurred.

MOMED = Educational level of child's mother (years of formal education)

HHSIZE = Number of household members present full time in the household, a measure of food demand

NKIDS = Number of children under 6 in the household, a measure of demand for caretaker attention

CADEQRAT = The ratio of adult-equivalents to members. This is measure of relative caloric requirements. (While this variable is somewhat redundant with household size and number of children, a model which omitted this variable had a lower R2 and F, and showed no lower condition number.)

STRATUM = Dummy variables representing the sample regions other than Santo Domingo, as explained in Section 2

The headship model included all these variables, as well as a dummy variable representing headship by each definition, and an interaction term between headship and calories (INTFHCALS) to test whether calorie availability has a different effect on children's nutritional status in female and in male-headed households.

There is an econometric problem with the models as specified. It is well known that illness, in particular diarrheal illness, fevers, and

respiratory infections, are associated with weight loss or with reduced velocity of weight gain. Typically, infection is one of the main precipitating factors which cause children to fall off their trajectory of growth. However, poorly nourished children are more prone to infections as well; the causality runs in both directions. Low nutritional status contributes to illness duration and prevalence as much as illness contributes to poor growth.

This creates an econometric problem of endogeneity, confirmed for the illness variable ny Hausman's test (Hausman 1975). Endogeneity exists when there is a correlation between the error in the prediction of the dependent variable and the stochastic error in one of the independent variables. To deal with this problem two-stage least-squares estimation (2SLS) was used. In the first stage, the endogenously-determined variable (illness in this case) is predicted; this predicted value of illness duration is used in place of the actual value in the second stage of the estimation. This can be viewed as the variable "purged" of the error which is causing the problem. The resulting variable, predicted illness, was included in all the equations for nutritional status in place of actual illness. The correlation between the predicted and the actual illness variable was .35, significant at $p<.0000$. However, the adjusted R^2 for the equation predicting illness was only .12, suggesting that significant variation in illness was not captured.

The model used to obtain the predicted illness variable is as follows

$$ILLNESS = +B_1LCALPA + B_2PROTDENS + B_3AGE + B_4HIRISK + B_5MOMED + B_6NKIDS + B_7HHSIZE + B_8CADEQRAT + B_9LNPCEXP + B_{10}LNPCEXP2 + B_{11}STONENDX + B_{12}CLEANWAT + B_{13}MOMED + B_{14}STRATUM + B_{15j}CARETAKERj + e$$

where

CLEANWAT = a dummy variable set equal to 0 if the household's water source is unprotected, 1 if it is piped water (whether inside or outside the house)

CARETAKER = a set of dummy variables such that GRANANT = 1 if the child's principal caretaker is an aunt or grandmother; SISTER = 1 if the child's principal caretaker is a sister, and OTHRCARE = 1 if the principal caretaker is someone else other than the mother.

Income level (represented by expenditure) was included in the illness equation as a proxy for access to medical services (although stratum is probably an important factor as well).

5.2.2 Results of the Basic Model

Table 7 shows the results of the estimation of the model to predict duration of illness. A few points are worth noting, since predicted illness is a significant determinant of nutritional status in the second stage of the model. Calorie availability is not significant in determining illness duration, but a higher protein density of the diet, controlling for calories, is very significantly associated with

shorter illness duration. (Recall that, by several measures, the diets in FHH contain more animal protein sources than those of MHH.) Controlling for the number of children, household size shows negative association with illness duration, possibly because more adults are available to take care of the children. Also, children whose principal caretaker is an aunt or grandmother have significantly longer illnesses. FHH are very significantly more likely to have their children cared for by a grandmother or aunt, by all definitions except Major Earner. As children get older, they are ill less, but the high-risk period is not significantly associated with illness. In contrast to other studies, these data show no relation of water source, number of other children, or mother's education with illness, though the latter two show the expected relationships with nutritional status.

In the lowest expenditure quartile, most of the same relationships hold, but both calories available and protein density are significant in predicting shorter or no illness.

Tables 8 and 9 show the results of the second stage estimation of nutritional status, first for the whole population and then for Quartile 1. A number of factors which distinguish MHH and FHH have a

Table 7 Results of the Estimation of the First Stage Predicting days of Illness in Previous Two Weeks

Dependent Variable: Illness

Independent Variables	All			Quartile I		
	B	Beta	Sig T	B	Beta	Sig T
LCALPA	-.7846	-.0523	.2371	-2.5044	-.1524	.0271*
PROTDENS	-.17249	-.1350	.0026*	-1.9047	-.1412	.0384
HHSIZE	-.3794	-.1619	.0013	-.2186	-.0987	.1577
NKIDS	.4197	-.0718	.1722	.2486	.0455	.5122
CADEQRAT	-6.5036	-.0681	.1337	-2.2170	-.0206	.7696
AGE	-.4285	-.1091	.0180*	-.5052	-.1272	.0584
HIRISK	-.5910	-.0427	.3462	-1.7740	-.1228	.0624
MOMED	.0083	-.56	.9083	.1227	-.0638	.3501
CLEANWAT	.6537	.0501	.3067	-1.2435	-.1016	.2030
GRAN/AUNT	2.7116	.1146	.0039*	4.2256	.1881	.0016*
SISTER	.5135	.0146	.7128	.3310	.0104	.8590
OTHR CARE	-.4007	-.0130	.7471	-1.4376	-.0289	.6102
LNPCEXP	5.6479	.6134	.0253*	8.5976	.7004	.1979
$LNPCEXP^2$	-.7371	-.6401	.0182*	-1.1208	-.5756	.2878
STONENDX	-.1045	-.0385	.0198*	-.1432	-.1424	.0375*
Other Urban	-2.8953	-.1938	.0000*	-4.6544	-.2686	.0004*
Frontier	-2.9353	-.1981	.0004*	-5.8416	-.4289	.0000*
Sugar Cane/Livestock	-2.5665	-.1345	.0056	-6.0359	-.3795	.0000*
Other Rural	-3.9622	-.2463	.0000*	-6.1825	-.4153	.0000*
R^2 - .1445			R^2 - .2755			
Adj R^2 - .1170			Adj R^2 - .2182			
F - 5 25			F - 4.80			
N - 610			N - 260			

Table 8 Results of the Estimation of the Basic Model Predicting Height-for-Age, Weight for Height (All Households)

Dependent Variables:

Independent Variables	HAZ			WHZ		
	B	Beta	Sig T	B	Beta	Sig T
LCALPA	.2554	.0854	.0457*	.0233	.0104	.8102
PROTDENS	.0735	.0289	.5474	-.0970	-.0507	.2992
ILLNESS	-.0285	-.0546	.4830	-.1217	-.3087	.0001*
HHSIZE	.0137	.0295	.5810	.0330	-.0942	.0825
NKIDS	-.2212	-.1896	.0003*	-.0734	-.0839	.1175
CADEQRAT	-.5735	-.0306	.5275	-1.6272	-.1151	.0190*
AGE	-.0016	-.0021	.9678	-.0558	-.0948	.0740
HIRISK	.0094	.0034	.9412	-.2788	-.1345	.0045
MOMED	.0454	.1529	.0010*	-.0470	.3178	
Other Urban	-.0169	-.0057	.9244	-.3824	-.1711	.0052*
Frontier	-.1687	-.0568	.3696	-.4241	-.1908	.0031*
Sugar Cane/Livestock	-.1928	.0508	.3666	-.5629	-.1978	.0006*
Other Rural	-.2706	-.0847	.2299	-.5492	-.2293	.0014

R^2	-	.1045	.0668
Adj R^2	-	.0850	.0465
F	-	5.34	3.30
Sig F	-	.0000	.0001
N	-	609	614

Table 9 Results of the Estimation of the Basic Model Predicting Nutritional Status (Quartile 1 Only)

Dependent Variables:

Independent Variables	HAZ			WHZ		
	B	Beta	Sig T	B	Beta	Sig T
LCALPA	.3138	.0940	.1331	.1593	.0667	.3049
PROTDENS	.0290	.0107	.8719	-.1936	-.0984	.1521
ILLNESS	-.1414	-.2674	.0386	-.1340	-.3489	.0080*
HHSIZE	-00691	-.1537	.0581*	.0263	-.0812	.3345
NKIDS	-.2685	-.2416	.0008*	-.1102	-.1375	.0645
CADEQRAT	-1.033	-.0491	.5148	-4.2454	-.2780	.0004*
AGE	-.0275	-.0341	.6637	-.0202	.0346	.6708
HIRISK	-.1802	-.0614	.3758	-.1213	-.0575	.4241
MOMED	.0656	-.1688	.0183*	-.0426	.1512	.0405*
Other Urban	-.6341	-.1833	.0575	-.2554	-.1014	.3040*
Frontier	-.7109	-.2551	0295	-.1328	-.0664	.5805*
Sugar Cane/Livestock	-.2243	-.0699	.5172	-.4388	-.1894	.0903*
Other Rural	-1.0106	-.3341	0131*	-.6733	-.3100	.0244*

R^2	- .1834	R^2	- .0979
Adj R^2	- .1400	Adj R^2	- .0508
F	- 4.20	F	- 2.08
Sig F	- .0000	Sig F	- .0200
N	- 257	N	- 263

significant influence on measures of nutritional status. Household-level caloric availability is positively associated with HAZ. Calories are not significantly related to WHZ. This is not as odd as it seems, since the calorie measure used does not reflect the time immediately preceding the measurement of WHZ. Illness in the 14 days prior to the nutritional status measurement has a significant negative effect on the measure of nutritional status involving weight. Protein density, not significant in any of the nutritional status equations, significantly reduces illness days, and so has an indirect effect on nutritional outcome. The total number of children six and under in the household, smaller in FHH by most definitions, is negatively associated with nutritional status (HAZ), as is the ratio of adult-equivalents to members, suggesting children may lose in the household competition for available nutrients.

Adding child's sex to the equations did not noticeably alter the observed relationships. The relationships in Quartile 1 are not appreciably different from those in the population as a whole.

5.2.3 Effect of Headship

In none of the two-stage least squares models tested does the effect of headship on HAZ or WHZ prove to be significant, either in the whole population or in the lowest expenditure quartile. The addition of the headship variables to the model adds very little to the explanatory power of the equations, with the exception of the models using the Major Earner definition. In these models (for the whole population and for Quartile 1 only), the two headship variables approach statistical

significance in the HAZ equation. Female headship is negative, while the interaction with calories is positive. The OLS regression using true illness duration rather than the predicted value found both Major Earner headship variables to be statistically significant at better than $p = .05$, with coefficients similar in direction.

As with the household-level models, though, interpretation of these results is quite ambiguous. The headship variable is strongly negative, but the interaction with calories is strongly positive. This suggests that FHH do allocate calories differently within the household, in such a way as to promote child growth. Female headship itself, though, shows a negative association with child growth, for which the allocation of calories compensates. Where only the headship dummy is entered, without the calorie interaction term, it is <u>not</u> statistically significant, presumably because it then incorporates both the apparent negative effect of female headship and the apparent positive effect of headship through the use of calories, which cancel each other out. Recall that total household calories per adult equivalent were generally lower in FHH, and that household calories do significantly affect nutritional outcome. The fact that the interaction term of Major Earner headship with calories is positive once again points to the need to investigate the dynamic patterns of intrahousehold allocation of food to understand why and how various definitions of headship do (or do not) affect nutritional outcomes for children.

6. Summary and Conclusions

This study uses information on households in the Dominican

Republic to investigate the degree to which alternative definitions of female headship identify the same households as female-headed. It explores whether such households are more likely to be low-income or economically vulnerable than male-headed households, and it tests whether female-headed households, by any definition, show different preferences for spending on basic needs or different resource allocation patterns leading to better welfare outcomes, specifically, nutritional status of children.

Six alternative definitions of female headship are investigated: The household's own self-definition; absence of adult males; woman as major earner (earning over 50 percent of wage income) or major income contributor (earning over 50 percent of total income); woman as a wage earner or as worker in any market enterprise.

The overlap among definitions is very imperfect; no definition fully captures the household's own criteria for defining itself as female-headed. But both absent-male and earnings-related definitions of female headship are very significantly related to the household's self-definition. A household female-headed by one definition is far more likely to be female-headed by another than are households in general.

By each definition, female-headed households have some characteristics which make them quite distinct from male-headed ones. Female-headed households are smaller and have fewer earners; they are far more dependent on transfers (gifts of cash from absent family members or others) and less so on wages and other earned income. Except for Absent-Male households, they are disproportionately urban, and so have less food from home production. Their heads are older, with fewer

young children, reflecting differences in life cycle. Absent-Male household heads are fully 10 years older than those of households with adult males.

By no definition are female-headed households are more likely to fall into lower income groups (measured by per capita expenditure). Households with women working are slightly more likely to be in the higher income classes. Their dependence on transfers, though, may indicate greater economic vulnerability and less ability to maintain their status over time.

The evidence on differential spending preferences is weak. Female-headed households by all definition spend proportionally no more - in some cases slightly less - on food than male-headed households in the same expenditure quartile. They tend to buy more expensive foods (indicated by a lower caloric return per peso of expenditure), including a higher proportion of meat, poultry and fish, and other animal-origin food; while male-headed households tend to buy somewhat more of the cheap, bulky staples - rice and beans. As a result, household calorie consumption per adult equivalent (adjusted for the age/sex composition of the household) is somewhat lower in female-headed households, and female-headed households by most definitions are more likely to fall into the risk category of calorie consumption less than 75% of recommended levels. This pattern may reflect a preference of female-headed households for higher quality foods. Dietary diversity and the proportion of animal-origin foods are both recognized as important contributors to improved nutritional status. Calories alone, especially measured at the household level, are not an accurate predictor of

nutrition and health outcomes.

In fact, children in female-headed households, in spite of lower available calories, achieve the same levels of nutritional status (measured by height/age and weight/height) as those in male-headed households. In Absent Male female-headed households, children's growth is significantly above that of male-headed households. This suggests that the allocation of available foods in female-headed households may be favorable to children.

Multivariate analysis was performed to determine whether sex of head itself, or the other household characteristics associated with headship, affect food expenditure, caloric (and protein) adequacy, and nutritional status of children. The results are clear. Once all other characteristics distinguishing female-headed households from male-headed households are controlled, headship itself adds little explanatory power to the determination of these outcomes: food expenditure, calorie and protein adequacy, anthropometric status. However, a number of characteristics of female-headed households are important determinants. For example, caloric adequacy is positively associated with home produced food and farm sales, and with household size, and negatively with transfer income, and adult-equivalent ratio, all affects which operate against female-headed households by most definitions. At the same time, nutritional status is positively associated with protein density of the diet (effect operates indirectly through illness), and negatively with number of children and adult-equivalent ratio. These relationships operate in favor of female-headed households.

This study provides some support for the hypothesis that female-

headed households allocate resources differently from male-headed households. The expenditure elasticity of food demand is generally lower in female-headed households than male-headed households, but Absent-Male female-headed households appear to allocate more of any marginal income increase to food spending. Among Major Earner female-headed households, marginal calorie increases are more positively associated with weight for height than in male-headed households, though female headship itself is negatively associated with this outcome. These effects are quite small. More persuasive is the observation that lower levels of caloric adequacy produce the same or better growth outcomes among female-headed households.

Overall the conclusions to be drawn are first, that the significance of female headship depends heavily on the specific definition of headship used. Second, there is no evidence that female-headed households at all income levels are more dependent on transfers and less on their own earnings capacity than male-headed households. Third, female-headed households have a number of characteristics which clearly distinguish them from male-headed households, and these characteristics are related to food expenditure, dietary adequacy, and nutritional outcomes of children. It appears that headship operates through these characteristics to result in female-headed households spending proportionally less on food, obtaining lower levels of caloric adequacy, higher levels of protein density and dietary quality (measured in terms of cost), and achieving equal or even slightly superior nutrition outcomes for their children.

These results are specific to the Dominican Republic, a middle-

income developing country where women's participation in the labor force is quite widely accepted, and women have good access to education and employment. These results are consistent with some other studies in the Caribbean, but there is no reason to expect generalizability to other regions of the world.

The policy implications of the study for the design of intervention programs is that female headship alone is not a good basis for program targeting or program design, but that the particular characteristics of households, some of which vary by sex of head, need to be explicitly accommodated in the development of such programs.

FOOTNOTES

1. The survey was conducted by the Tufts University School of Nutrition under a cooperative agreement with the Office of Nutrition, U.S. Agency for International Development, (Grant DAN-1275-A-00-4085-00) for the purpose of investigating the consumption effects of price and income changes. A complete description of the survey methods may be found in Rogers and Swindale, 1988.

2. Food consumption was measured by successive 24 and 48-hour recalls covering seven consecutive days. Quantities were estimated volumetrically using food models. Local measures and household containers were converted to standard weights. Calorie and protein content of food was estimated from available food tables (USDA, 1975 a,b; INN, 1983; SESPAS, 1984). Edible portion information was obtained from the tables or calculated directly from measurements of a sample of the foods.

3. Household members were assigned to one of 14 age/sex categories. For each category, the protein and calorie needs were calculated as a fraction of the needs of an adult male weighing 45 kg, of moderate activity, based on FAO/WHO recommendations (FAO, 1985).

4. The survey was conducted by F. Cate Johnson of the Tufts University School of Nutrition with funding from the Office of Health, Population and Nutrition, USAID Mission to the Dominican Republic, Santo Domingo. A complete description of the methods may be found in Johnson, 1987.

5. Height and weight for age and weight for height were converted to standard scores representing deviations from the median of the NCHS

standards (WHO 1983).

6. It was common for women in the Dominican Republic to engage in very small business enterprises such as selling ice cubes, or buying a large bottle of shampoo and selling it in individual portions.

7. These results differ slightly from those reported in Johnson and Rogers, forthcoming, on the same topic. One reason is that for the present study we have limited our sample to those children (about two thirds of those in Johnson and Rogers) who were part of the original survey. More important, in this study case weights were adjusted so that households with more children were down-weighted, since the sample was originally designed to be representative of households, not of individual members. Nonetheless, the results reported here, particularly regarding Self-Defined and Absent Male FHH, are fully consistent with those in Johnson and Rogers.

8. This is in no way meant to suggest that dietary adequacy is not a good indicator of nutrition risk, if more direct measures are not available. Individual measures, if available, are clearly better, though.

9. Nutrient content was suggested for edible portion. Minor fruits and vegetables were not included in the quantity estimates. No adjustments were made for intrahousehold distribution of food, nor for the number of people eating.

10. This variable is intended to account for the higher risk if illness and inadequate nutritional status during the period from nine months to a little over 2 years. This age poses special risks for two reasons. Breast milk ceases to be adequate to support child growth

after about 6 months, but children this young need frequent feedings of supplementary food because of their small stomach capacity, and they may have less access to family food because they are less mobile and less able to compete. In terms of illness, this is the age at which children are able to move around and put things in their mouths, a high risk age for illness.

Chapter XII.1

ANALYSIS OF TIME ALLOCATION AND ACTIVITY PATTERN OF WOMEN IN RELATION TO CHILD CARE AND NUTRITIONAL STATUS IN KIKWAWILLA/KAPOLO VILLAGE, KILOMBERO DISTRICT, MOROGORO REGION, TANZANIA

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INTRODUCTION

Several studies and Tanzania/Unicef report (1985) observe that rural women in Tanzania work long hours in order to fulfil their dual role as "reproducers" and "producers" (1,2,3,4).

Women's role as "reproducers" is categorized in 2 ways. First, "biological reproduction" which includes pregnancy, birth and lactation. Secondly, "social reproduction" which implies women's domestic responsibilities. Their role as producers refers to their food production and economic related activities (5).

Evidence from time budget studies in Tanzania suggest that women's workload often has negative impact on their nutritional status and on their children. Some studies also indicate that women's work situation does not change much during pregnancy (1,2,6,7). Whether this is the case throughout the year or at certain times is not reported.

High incidence of infections often accompanied by inadequate child care and reduced food intake in children contribute substantially to early faltering of growth in the first year of life and continue to do so in the ensuing years (8,9,10).

Poor maternal nutritional status during pregnancy and lactation, combined with heavy physical labour and low energy intake particularly during peak agricultural season has been shown to be determinants of low birth weight and

diminished milk production (9,10,11 12). Women's intensive physical labour is predicted to be one of the risk factors for higher than average infant and child death rates in Kilombero villages (12). Of the 38 deaths in Kikwawilla village in 1987, 42% and 16% were of infants and children under five years of age respectively (13).

The purpose of this joint TFNC/STIFL study[1] was to analyse women's time allocation and activity pattern in relation to child care and maternal and child nutritional status in Kikwawilla/ Kapolo village during the lean and post-harvest seasons.

GENERAL OBJECTIVE

To describe activity pattern and analyse time allocation for all activities performed by women in Kikwawilla/Kapolo village during lean and post-harvest seasons and to relate it to child and mother's nutritional status.

- **Specific objectives**

To assess the nutritional status of selected mothers and of their children under five years of age.

To observe and record the time allocated for all activities of women during lean and post-harvest seasons from the time they wake up in the morning till they go to bed at night.

To determine mother's time devoted to child care in relation to overall work day in lean and post-harvest seasons.

To assess mother's overall work day in relation to child's nutritional status.

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[1] The study was carried out jointly by Tanzania Food and Nutrition Centre and Swiss Tropical Institute Field Laboratory (Ifakara)

Chapter XII.3

To assess mother's energy expenditure in relation to her nutritional status.

To compare time allocation data obtained by actual measurements with that obtained by 24 hour activity recall.

- **Hypothesis**

  Women's workload is inversely related to child's nutritional status.

  Women's workload is inversely related to their nutritional status.

  Women's workload is related to the type of work.

  Women's workload is correlated with family size.

  Women's workload varies with season.

- **Conceptual Framework**

Nutritional status and growth of children underfive years is determined by their food and nutrient intake and health status.

As shown in conceptual model (figure 1), the interplay of social, environmental, attitudinal, cultural factors influence mother's work load and time and therefore the child care time. This in turn influences the amount of time devoted to child's health care and feeding frequency and the type of food given.

For example, does she have adequate time to feed an 8 month old for 5-6 times a day as generally recommended, or to take the child regularly to the follow up clinic for immunization and growth monitoring? (1,14).

The nature of activities of women determine their activity pattern, total work time and hence the workload for the day. Women's workload also varies with family size, seasons and availability of basic amenities such as the safe water and firewood supply.

Activities which rural women get involved with most frequently are

categorized as food production (includes farming, food processing) income generating, domestic and childcare. Occasional activities of women include attending funerals, going to the market or to the church, participating in village activities and so on. Some time may also be spent on resting and recreation activities such as visiting friends, or going to the village bar for drinking beer.

Mother's basal metabolic rate (BMR) is determined by her body weight. BMR, type of activity and the amount of time spent for it determine her energy expenditure (15). The balance of her energy expenditure and energy intake affects her nutrition status. This in turn influences her work output and the degree of productivity.

Hence, mother's workload could cause negative energy balance which may affect the nutritional status of children underfives and the birth weight of infants.

Therefore, as discussed above women's work and nutritional status and the growth in children is determined by the combined effects of several factors. Evidently, before an intervention programme aimed to reduce or alter women's workload and improve both child and maternal health is planned, it is important to understand all the factors associated with women's work, and the nutritional status of both the women and their underfives.

STUDY SETTING

Geography, Demography and Economic Activities:

Kikwawilla village is situated in the Kilombero District (Morogoro region (figures 2,3), 14 km NE of Ifakara. The region is positioned inland from the coast with the Kilombero river flowing through the region (16). The other

districts of the Morogoro region are Morogoro, Kilosa and Ulanga.

Kikwawila village lies in the fertile basin of the Kilombero river. Its location along the trunk road to Mikumi makes it easily accessible throughout the year. The nearest Tazara (Tanzania - Zambia) railway station is 3 km NW of the village (see Fig 2c).

The village expands over about 50km^2 and consists of three sectors: Kikwawilla, Kapolo and Kilama (fig 3). The present study of Women's workload and time allocation focuses on the Kikwawilla/Kapolo sector, which has most features of Kilombero riverplain, such as soil, climate and agricultural structure (16). Also, the sector extends over a large area, hence representing a "cross-section" of the Kilombero valley. Kikwawilla/Kapolo was comprised of 300 households with 1550 inhabitants (16). Although over 30 different tribes have been identified in the area, six major tribes make 84% of the population (Ngoni, Mbunga, Pogoro, Ndamba, Ngindo, and Ndwewe (16). Three fourths of the inhabitants claim to be muslims, the rest are christians. Most of the houses are built in the traditional style, with mud walls and grass roofing ("manyasi" or "makuti").

The village experiences 2 seasons: the rainy season being from December-May, and the dry season from June - November (16). However, Kilombero valley is classified as a rain-shadow area.

Ninety percent of inhabitants are subsistance farmers cultivating maize and cassava as food crops and rice as both cash and food crop. Some cashewnuts, sugar cane, a little cotton and simsim are the cash crops. In 1988, about 27,429 kilograms of paddy were sold at the cooperative branch and 19,405 kgms of cotton. Fish from Kilombero river is another food consumed and is also a source of income for some villagers. Livestock is limited to only subsistence poultry.
Both the village government and the party branch have their own offices in the

village.

HEALTH SERVICE AND HEALTH STATUS

Kikwawila village itself has neither a health centre nor a dispensary. It is within walking distance from a nearby Kibaoni dispensary (5km) and a Designated District Hospital (St Francis) (7 km). The village has 3 village health posts (VHP) served by village health workers (VHW) in each village sector. Primary Health Care (PHC) services were initiated by Swiss Tropical Institute Field Laboratory (STIFL) and Kilombero District Health office (DHO) in 1981 (16). The mobile MCH clinic fron the St. Francis Hospital visits the village once a month. The patients seen at the VHP are refered, if necessary, to the St. Francis District Hospiital in Ifakara (10-17km) or to the dispensary at Kibaoni (4 km). Malaria is hopl-to hyperendemic. Other endemic diseases are urinary schistosomiasies, hookworm (N. Americans) Strongyloides and G. lamblia (17).

Malnutrition is also common. An antrhropometric assessment of the community by STIFL showed a high degree of stunting (37-71%) and a substantial proportion of wasting (3-20%) by Waterlow Classification (15).

In 1984 crude birth rate was 54/1000; crude death rate 17/1000. Infant mortality rate was 198/1000 (National average 120/1000). The majority of the village population has had access to clean water supply since 1986, the source being either piped water or protected shallow wells. A few households seek water in ponds, creeks and temporary hand-dug wells for all domestic purposes.

The village has no electricity and owing to the unavailability or high price of paraffin, most households are used to the darkness. The village has 2 primary schools which often admit children from 9 years of age and seldom from 8 years) because of the limited space. School attendence is irregular, relevant

data are not available. Adult education classes exist, but are not held regularly.

The village of Kikwawila/Kapolo has been under constant research and surveilance by STIFL for a variety of community health projects and logitudinal studies. In 1988, Kikwawilla/Kapolo became a village for UNICEF Child Survival and Development Programme the overall objective of which is to reduce infant mortality rate through active community participation (16,18). (Appendix 1 presents population profile according to 1988 Census).

METHODOLOGY OF THE STUDY

The methodology of the study was divided into two main stages, the first stage was pre - survey procedure which focused on the preparation of the survey including the visit to the survey site. The 2nd stage was the actual survey.

1. First Stage (Pre-survey procedure)

1.1 Questionnaire Design

1.2 Visit to the study area to:

- select and train enumerators
- pre-test questionnaires
- select subjects and inform them about the purpose and the procedure of the survey

1. **Questionnaire design**

Based on already available information from previous studies and reports, questionnaires were designed for pre-testing prior to the visit to the study area.

Data collection for the study was divided in 3 stages. Two questionnaires were compiled in accordance with the specific objectives and hypothesies of the

study (appendix 2,3,4).

Questionnaire 1: Administered to mother's of children under 5 to obtain information of household and factors influencing her work load and activitiy pattern. **Questionnaire 2:** Completed by interviewers who observed and recorded activity using stop watches. **Questionnaire 3:** Weighed and measured heights of both mothers and index children.

2 Visit to the study area

Information about the purpose of our visit was communicated to the village leaders and the headmaster of the primary school by STIFL representative who was to participate in the study.

- selection and training of enumerators

Potential candidates who were to assist with the study were already selected by the headmaster of Kikwawilla primary school prior to our arrival to the study area. All the enumerators were females having completed seven years at school that is the 7th standard at primary school. They were explained the objectives and methods of the study and taught how to operate the stopwatch and measue and record time spent by mothers to carry out their differnet activities over a period of 2 days. This had included practical training with mothers who were not study participants. Ten enumerators were evantually selected to assist with the study. Their selection was based on their ability to operate the stopwatch and measure and record time spent by the mothers for their different activities accurately and as required.

- pre-testing of the questionnaire

This was carried out among the mothers living close to the village

school and who were not to be part of the actual study.

- Selection of the subjects

These were fifty women out of 100 all of whom had children below five years of age and had participated in STIFL study on causes of infant mortality. Of those 50, 25 mothers had undernourished children (below 80% Weight for age (W/A by Harvard Standards) (19). The remaining 25 had healthy children (above 80% W/A). These two groups were matched by age, sex, family size, number of underfives and number of caretakers of the child (incase of 2 children per mother, the younger one was selected).

2 Second Stage

Data Collection

Time Allocation Observations

This involved detailed recording of time taken by the mother for each activity she performed during a five day period during the post-harvest (October 1988) and lean (March 1989) seasons. Each enumerator followed one selected mother from the time she woke up in the morning until she went to bed at night. Time allocated for all activities was measured and recorded in minutes with the stopwatch. When measuring the time spent with the stop watch, each eumerator was required first to ensure that the stop watch needle was on "zero". The needle was set off in motion as soon as the mother started her activity and stopped and time recorded as soon as she finished it. By this time, the needle should have been set on "zero" again, and the stop watch should have been set such that it had started to measure the time for the activity which followed. Each mother was followed for five consecutive days. The enumerators were closely supervised by the authors throughout the exercise which lasted for 25 days (Appendix 2).

Basic Household Data

This involved interviewing of the mothers by the authors during the post-harvest season. A structured questionnaire, sought information on household socio-economic status, and factors influencing women's activity pattern and overall workload. Each mother was also asked to describe in detail her activity pattern and time spent in minutes during the past 24 hours. The interviews were carried out during the "time allocation study period" so as to be able to compare the "activities recorded" with the "24 hour recall" method. Both the time allocation observations and basic household data collection had included qualitative data collection, observations and informal questions to the respondents (Appendix 3).

Anthropometry Measurements:

Weight:

The children were weighed and the weight was recorded to the nearest 100gm with Salter Scales. Scales were marked in kilograms and were checked frequently by the use of known weight. Each child was weighed naked. Bathroom scales were used for weighing the mothers. The machine was frequently checked using a known standard weight. Each mother was asked to stand barefoot with mimimum clothing in the middle of the weighing scales. The weight was recorded to the nearest 0.5kg (Appendix 4).

Lengths and Heights:

A length board was used to measure the lengths of children below 3 years of age. Microtoise (UNICEF), a 2 meter tape measure, was used to measure the heights of all the older children and the mothers. In recording height measurements, each child or mother was made to stand barefoot, and fully erect against a wall to which the the tape measure was attached. Measurement was recorded to the nearest

0.1 cm (Appendix 4).

Data Analysis:

Time Allocation and Activity Pattern

Information of each mother's activities was measured and recorded for 5 days in post-harvest and lean seasons. Average amount of time taken in minutes per day for each activity by every mother during the 2 seasons was calculated. These activities were then categorized as domestic, childcare, farming, income generating and ex-domestic. The activities were also categorized as occupation, domestic, farming and resting for energy expenditure estimates of each mother as recommended by WHO/FAO/UNU (Appendix 5) (15). Basal metabolic rate (BMR) and energy expenditure were calculated for each mother by age and weight in accordance with the guidelines by WHO/FAO/UNU (15).

Basic household Data

The data was analysed using the EPINFO and MICRSTAT general purpose statistic packages to provide:

Descriptive Statistics:

Frequencies were presented as tables, bar diagrams, histogarams using mean, standard deviation, median and percentages.

Inferential Statistics:

Association between selected variables was assessed using Chi square test, Student's t-test (data was not normally distributed hence transformed to logs) correlation and regression For all statistical tests mentioned, significance level used was 5% or $p < 0.05$.

Anthropometric Data of children was analyzed by the computer with the Centre for Diseases Control anthropometry software package (CASP) using National Centre for Health Statistic (NCHS) standards for growth curve for children 0-18 years of age

as refernce standards (20). The indicators used were weight for age (W/A), height for age (H/A), and weight for Height (W/H). The nutrition status of children was classified as follows:

Underweight - W/A less than -2 SD of the NCHS median.

Wasting - W/H less than -2 SD of the NCHS median

Stunting - H/A less than -2 SD of the NCHS median.

Mother's nutritional status was assessed by Body Mass Index or Quatelet Index (weight in kg/Height in meter^2) (20).

The indices used were: Underweight - BMI = <19

Normal - " = 19-24

Overweight - " = >24

Presentation of findings to the Community

A preliminary report summarizing the results of the study was compiled in Swahili and presented to the village and district officials (Appendix 6). Major findings were discussed with the study subjects and the community leaders through the focus group discussions (22) (Appendix 7). These discussions provided useful guidelines for interventions.

Problems encountered during the Study

1. Given the difficulty of minute by minute measurements, it is possible that the "recording" of mother's time allocation was sometimes either missed or over or under-estimated because of the nature of the instrument used. The mother might have already started on the new activity while the enumerator was still recording the time spent to perform the previous activity.

2. All mothers and children could not be included in the final data analysis owing to the missing information of time allocation and anthropometry.

This was because some mothers could not be followed in both the seasons for reasons such as: they had moved; they had travelled; they had moved to their field site for farming. Heights of all children were not measured in October 1988.

3. Information related to pregnancy and lactation was recorded in October 1988 only.

4. The sample of the children included more girls (71%) than boys (29%) children. Whether or not, this unequal ratio affected the quality of the data collected is uncertain.

5. Large variations in time spent for each activity by women, produced large standard deviations for mean and sometimes exceeded the mean.

6. Owing to missing data for some variables for some women, total sample size tended to be different for these variables.

7. During the study period, it is possible that some women did not bother about activities which took them away from their homes for example farming during lean season. Therefore, the time allocated for farming and other external household tasks and rest during both seasons is probably over or under-estimated.

RESULTS

Baseline Data

Children

Age and Sex Distribution

A total of 34 children age 1 month to 63 months were followed during both the post-harvest and the lean seasons. The sample had more girls (71%), than boys (29%). Age distribution of the children surveyed is presented in Table 1. Over 2/3 of the children (71%) were under 36 months of age. The rest were over

36 months of age. Mean age was 27 (SD+18). months.

NUTRITIONAL STATUS

The nutritional status of children by Weight for Age (WA) was compared with the NCHS reference standards (20). When the weight of each child in October 1988

Table 1--Age distribution of Children

[2]Age in mths	No Children (%)
0-11	9 (26.5)
12-23	6 (17.5)
24-35	9 (26.5)
36-47	3 (09.0)
48-60	7 (20.5)
Total	34 (100)

was compared with that in March 1989, it was noted that 18 (53%) children had lost weight and 13 (38%) had gained weight. Weights of 3 (9%) children had remained the same. However, the proportion of underweight and not underweight children remained the same in both the seasons (Table 2).

As can be noted, the overall prevalence of undernutrition was similar in both seasons; 62% of the children were underweight (< -2SD W/A). In post-harvest season 2 children were above median. Twenty four percent of children were below -3 SD for WA thus indicating severe chronic protein energy malnutrition (PEM) among children underfives in this village. The prevalence of acute malnutrition by weight for height (WH) was low.

[2] The children were 5 months older in lean season (March 1989)

Table 2--Nutritional status of children in post-harvest and lean seasons

Nutritional Status (Z score-W/A)	No of Children			
	Post-harvest		Lean	
	No	%	No	%
Above Median	2	6	0	0
Between Median and -2	11	32	13	38
Between -2 and and -3	13	38	13	38
Below -3	8	24	8	24
Total	34	100	34	100

Mothers

Age Distribution

Time spent for different activities was measured and recorded for 34 mothers out of 50 selected initially in both the post-harvest and the lean seasons. Table 3 depicts the age in years of the mothers studied.

Table 3--Age distribution of Mothers

Age in Yrs	No Mothers (%)
18-19	2 (6.7)
20-29	10 (33.3)
30-39	14 (46.7)
40-49	4 (13.3)
Total	30 (100)

Missing data for 4 mothers

More than 1/2 the women were between 30 and 40 years old.

Mean age of women was 30 years (SD+8); maximum age was 48 years and minimum age was 18 years.

Nutritional Status

Nutritional status of the mothers was assessed by Body Mass Index (BMI = weight in kg/height in metre^2) (21). Table 4 shows the nutritional status of 24 non-pregnant women who were weighed in both seasons. Of the 24 non-pregnant women followed, 16 (67%) were of desired weight, 5 (21%) were underweight and 3 (12%) were overweight in

Table 4--Nutritional Status of mothers in both seasons

BMI	Nutritional Status	Post-harvest No (%)	Lean No (%)
< 19	Underweight	5 (21)	10 (42)
19-24	Desired Weight	16 (67)	13 (54)
>24	Overweight	3 (12)	1 (4)
Total		24	24

post harvest season. In lean season, 10 (42%) were underweight, 13 (54%) were desired weight and 1 (4%) was overweight (Table 4). Mean BMI of non-pregnant women was 19.7 (SD+2.35) in October 1988 and this was not significantly different from that in March 1989 (20.5+2.54). Range: October'88 - 16-26.5; March'89 - 17-27.7

Pregnancy and Lactation

Information regarding pregnancy and lactation of 34 women was recorded for only post-harvest season. As can be noted in Table 5, 10 (29%) women were pregnant and 15 (56%) women were lactating during the survey period in October 1988. Assesment of nutritional status of the pregnant women was not possible as no information about their gestational age was available.

Characteristics of Households

Of the total 290 households (H/H) in Kikwawilla/Kapolo, 34 H/H, 34 women and 34 children under five years of age were involved in the study during both seasons. These 34 H/H represented 11% of all H/H in the study area and 34% of sample frame.

Demography

The total population of the sample H/H was 202. There were 90 (44.5%) males and 112 (55.5%) females. During post-harvest season, the large proportion of population (61%) was within the age group of 0 and 15 years of age (22% under five years of age, and 39% 5-15 years).

Household size

The average household consisted of 6 persons (ranging from 2 to 12 members). Eighty five percent of H/H had 3-8 persons whereas 12% had between 9 and 12 persons. Two third of H/H had 1 child under five years of age. Twenty nine percent of H/H had 2 children and 6% of H/H had 3 children below five years of age. One H/H had five underfives but they did not belong to the same mother.

Marital Status

Of the 34 women who participated in the study, 31 were married and 3 were divorced during the post-harvest season. During the lean season 5 months later, 1 of the divorced women had remarried and was staying with the husband.
As regards number of wives, 25 (78%) women were the only wife of their husbands. The rest 7 were amongst 2 (13%), 3 (3%), and 4 (6%) wives of their husbands. Wives were noted to stay together in only 2 out of 7 "polygamy" households (H/H).

Age of Husbands

Mean age of husbands was 40 (SD+11) years. Minimum and maximum ages were 24 and 60 years respectively. Forty eight percent of the husbands were less than

40 years old and more than 30% were 50 years or older. Figure 4 compares the age of women with that of husbands.

Education

Educational achievement of 34 women and their husbands was categorized into their level of education as displayed in fig 5 The mean level of education attainment of husbands was class 5 and of women class 4. Eleven women (32%) and five (15%) husbands (of 31 women) had never been to school. Standard seven/eight of primary school was completed by 10 (23%) women and 11 (35%) husbands. Of the 3 divorced women, 2 were standard 7 leavers while one had left school after finishing standard 4.

Mean education attainment of women was significantly lower than that of men (Student t test $p < 0.05$), (Figure 5).

Occupation

Farming dominated by subsistence crops was the main occupation of all 34 married women. As well as being farmers, 22 (65%) women were engaged in petty business such as selling of home brewed beer, cooked food and so on. One woman worked as government officer (Figure 6).

Agriculture Livestock

Livestock was restricted to poultry for home consumption for 16 (47%) households and for both home consumption and sale for 6 H/H. Few households also reared ducks.

Farms and Home gardens

Mean farm size of the farms owned by all H/H was 5(+4) acres, ranging from 1 to 15 acres. Of the 34 H/H, 27 (79%) had farms both within the vicinity and away from their homes. Four H/H (12%) had farms only near their homes and 2 H/H (6%) had farms only away from their homes. No information was recorded for 1

(3%) H/H. Mean size of the farms way from was 3 acres (SD+3) and that near the home was 3 (SD+2.5). (Farm near homes:

Minimum = 2, Maximum = 15 acres and away from homes: minimum = 2 and maximum = 11 acres).

Table 5a--Size of farms of Households (with both near and far)

Size (acres)	Farm - far % H/H	Farm - near % H/H
1-2	44	63
3-4	30	18
5-8	22	15
>8	4	4
Total	n= 27 100	100

Table 5b--Size of farms of Households (with either near or far farms)

Size	Farm - far No H/H	Farm - near No H/H
1-2	2	1
3-4	1	1
5-8	0	0
>8	1	0
Total	4	2

Small home vegetable gardens were common. Fruit trees such as pawpaw, mangoes and oranges were commonly found around most H/H.

Water Supply

Sixty eight percent of sample H/H had access to pipe water supply only. Twenty three percentage got water from wells only, while 3% sought water from both well/ pipe. Six percent of H/H obtained water form rivers or wells.

Nineteen women (56%) women felt that the water supply had increased during the past 2 years. Nine (26%) thought, it had decreased, 5 (15%) felt that the situation was the same 1 (3%) observed that there was no water at all.

Food Availability and Consumption

Maize, rice and cassava were the main staples grown in the area. During the study period, 79%, 71%, 88% of households (H/H) had cultivated maize, cassava and rice respectively. Other food crops grown by few H/H included cowpeas, sorghum, green mung and beans. Cash crops grown included cotton, and cashewnuts. Maize, cassava and rice were the main staple foods of the sample H/H. All H/H consumed more than one staple daily. Eighty percent of households consumed maize, 59% consumed cassava and 47% consumed rice during the study period in post-harvest season. Fish, beans, pigeon and cowpeas were observed to be the main sources of protein. Few households consumed meat (15%), chicken (6%). Cashewnut, a source of fats, was eaten as a snack; no household was seen to use it for cooking. Consumption of green leafy vegetables by all households was regular but of fruit of any kind was rare.

Type and frequency of foods consumed

Tables 6 and 7 summarize the information on the number of meals and the type and frequency of foods consumed by households during the study period in the post-harvest season. The information was obtained through 24 hour dietary recall by mothers. However, the portion sizes of these foods as depicted in Table 7 for adults and children was recorded during the dietay survey carried out in 1983 (23). As can be seen, maize ugali (stiff porridge) was eaten most and often for 2 meals a day. This was followed by rice and then cassava. For the relish, chicken and fish ranked first followed by cowpeas and green vegetables. Post-harvest season allowed more time for poultry rearing and fishing. Number of

Table 6--Number of Meals consumed by Households

No. Meals	% H/H
1	3.1
2	34.4
3	53.1
4	9.4

Table 7--Frequency and types of foods consumed by H/H

Food	Frequency	Consumption per capita and meal in gm (23) Adult	Child
Maize Products		53	9
Ugali	1.4		
Uji	0.2		
Rice	0.6	240	147
Root Vegetables		285	170
Potato	0.2		
Cassava	0.6		
Plantain	0.2		
Pulses		100	87
Kunde (cowpeas)	0.4		
Beans	0.2		
Mbaazi (pigeon peas)	0.1		
Meat	(0.2)	39	27
Chicken	(0.8)		
Fish	0.6	89	58
Green Vegetables	0.4	24	30
Cashewnuts	0.2	10	8
Fruit	0.03		

A = Adults, >16 years of age
CH = Chidren, 6 months - 16 years of age

*Source: Lukmanji and Tanner 1985

meals consumed by households ranged from 1 to 4 (Table 6). Mean number of meals consumed per household was 2.7 (SD+0.7).

Household size and Nutritional Status of Children

Using 6 as cut off point for H/H size, H/H size with less than 6 members were considered small. Those H/H which had 6 or more members were classified as large. Twenty (59%) H/H were large and 14 (41%) were small H/H. Tables 6a a and 6b compare the nutritional status by weight for age (W/A) of the children in small H/H with that in large H/H in post-harvest and lean seasons respectively. It seems that more children in large H/H are undernourished by Weight/Age than those in small H/H. However this was statistically significant during the lean season only (Chi square - $p<0.05$).

Table 8--Relationship between Household size and Child's Nutritional Status in Post-harvest and Lean Season

Weight/Age (year)	Household Size more than 6	6 or less	Total
(Post-harvest season)			
Underweight	13	8	21
Not Underweight	7	6	13
Total	20	14	34
(Lean)			
Underweight	15	6	21
Not Underweight	5	8	13
Total	20	14	34

Activities and Child Care and Nutritional Status

Information on women's activity pattern and time allocated in minutes for each activity for 34 women was measured and recorded with stopwatches for a total

of 5 days. The information was used to deduce the overall activity pattern of the women in relation to child care and nutritional status and maternal energy expenditure and nutritional status. Using the mean time allocated for activities as cut off point, time taken for domestic, child care and farming activities was compared with the children's nutritional status (Chi square test <0.05)

Activity pattern and Time Allocation

Factors which influenced day's activity pattern included season, number of meals prepared, ex-domestic tasks such as attending funeral, and so on. Overall, daily activity pattern of women remained the same on all days and both the seasons, unless interrupted by a rare or an emergency activity such as death in the village/family or a sick family member. The amount of time allocated for some of the activities varied with season. For all women, the day started at 6am to 6.30 am in the morning and ended at 9 pm to 9.30 pm at night (Appendix 8). All activities perfomed by women have been categorized as:

- domestic which included, food preparation, water and firewood collection, splitting of firewood, cleaning yard, house and dishes, and washing clothes (Table 9)
- child care which included, breastfeeding and feeding, washing and bathing, playing with the child, and taking the child to the clinic (Table 10).
- farming which included walking to and from home to the field, all farming activities (Table 12).
- income generating activities included beer brewing, mat making and other petty cash business such as selling of cooked food along the roadside or near the school (Table 15).
- Resting included lying down to rest, recreation and eating. Talking

to a neighbour or a passer by or going to the nearest bar for drink was categorized as recreation (Table I6).

- ex-domestic activities included occassional activities such as going to the market, hospital, funeral, village meetings and so on (Table 17).

Time Allocation For Activities 1. Domestic Activities

Average amount of time spent per day on domestic tasks was 258 minutes in post-harvest season and 259 minutes in lean season. A large proportion, almost 2/3 of the total domestic time was devoted to food preparation in both the seasons. All domestic activities, except for firewood collection, were carried out. The average work time per woman per day was 11hrs 4 minutes daily (664 minutes) and 13hours 45 minutes (825 minutes) in post-harvest season and lean season respectively. No relationship was observed between the time spent on domestic activities and children's nutritional status.

The total amount of time allocated for all domestic activities was the same in both the seasons. Domestic Activities accounted for 39% of total day's worktime during post-harvest season and 32% in peak agricultural season. Food preparation was the most time consuming daily activity for all 34 mothers in both the seasons. Pipe water supply was within easy reach for 68% of the subjects. Mean number of buckets collected per day were 5 (SD+3), (minimum 2 and maximum 12). Using student t test, mean time spent in October 1988 for each activity and overall domestic activities was compared with that in March 1989,

Table 9--Time allocated (Minutes) by women for Domestic Activities in Post-harvest and Lean seasons

Activity Mean + SD	Post - harvest Time (n=34)	No women Mean + SD	Lean Time (n=34)	No Women
Food Prep	168 + 54	34	155 + 57	34
Fetch Water	30 + 22	34	21 + 13	34
Collect Wood	9 + 11.5	25	18 + 35	23
Split Wood	3 + 5	21	7 + 7	27
Clean Yard	18 + 12	33	14 + 9	33
Clean House	8 + 8	34	12 + 19	34
Clean Dishes	14 + 13	32	14 + 10	34
Wash Clothes	8 + 13	14	19 + 19	30
Total	258 + 71	34	260 + 84	

no siginificant difference was observed. All activities except for fire wood collection were carried out daily. Domestic activities were observed to take up large share of any woman's work day. Food preparation was the most time consuming of all domestic tasks (Fig 7). Seventy five percentage of women had [3]help from other household members, neighbours or relatives with collecting water and 68% with firewood collection. During the past 2 years, 27 (79%) women, firewood had considerably decrease. Only 2 (6%) women thought that it had increased while 5 (15%) felt that the situation was the same as that 2 years ago. Two women who sent their children to the village health post in post-harvest season spent 35 and 49 minutes respectively. This included the time taken to walk to and fro home to clinic and to wait at the clinic. In lean season, 12 mothers sent their children to the visiting MCH mobile clinic in the village. Time allocated for playing with the child was observed to be significantly higher

[3] Data available for October 1988

in post-harvest seasons than that in farming season ($p<0.05$). Time allocated for breast feeding was not easy to record, hence may be an under-estimation (Table

2. Child Care

Table 10--Time Allocated (Minutes) by Women for Child Care Activities in Post-harvest and Lean seasons

Activity	Post-harvest Time Mean + SD	Post-harvest No Women (n=34)	Lean Time Mean + SD	Lean No Women (n=34)
Breast Feed	10 + 19	13	18 + 25	18
Feed Child	18 + 23	25	17 + 13	30
Playing with Child	66 + 55	31	26 + 37	27
Wash Child	8 + 6	30	9 + 7	31
Child Clinic	2.5 + 6	2	30 + 60	12
Total	107 + 76	34	101 + 91	34

10). A total of 13 children were observed to be breast fed during the survey period in post-harvest and 18 in lean seasons. Time spent for feeding the child did not vary with season (Fig 8). But, of the 34 mothers, 25 (74%) and 30 (88%) fed their children in post-harvest in lean seasons respectively. The rest of the children were fed by older siblings. One child was observed to be fed by the father. Number of times, children were being fed was recorded by 24 hour dietary recall of mothers in post-harvest season only. Children got fed for 1 - 4 times a day (Table 11).

It was observed that the snacks inbetween meals were uncommon, only 10 children were observed to consume fruit, cashewnuts, roast cassava or boiled potato inbetween meals. Child care time accounted for 16% of total day's work time in post-harvest and 12% lean season. No association was found between the

Table 11--Feeding Frequency of Children

No of Times	No Children (%)	
	Snack	Meals
0	24 (70.5)	0
1	8 (23.5)	2 (2)
2	1 (3.0)	4 (11)
3	3 (3.0)	20 (59)
4	0	8 (24)
Total	34	34

children's nutritional status and child care time.

3. Farming/Food Production

Table 12--Time allocated (Minutes) by Women for Farming in Post-harvest and Lean seasons.

Post- harvest			Lean	
Activity	Time Mean + SD	No Women (n=34)	Time Mean + SD	No Women (n=34)
Farming	69 + 81	26	183 + 131	

Mean time spent for farming was 3 times more in March '89 as compared with that in October '88, (Table 12). This was statistically significant by student t test ($p<0.05$), (Table 12). (fig 9). According to the women, they spent 9.5 (SD+10) minutes to walk to their farm near home (minimum 0 minutes and maximum 30 minutes). Mean time taken to walk to the farm considered to be far away from the house was 55 (SD+39) minutes (minumum 10 minutes, Maximum 180 minutes). Almost 2/3 of the women took less than 5 minutes to walk to their farm near home,

while 50% women spent about more than 1 hour to walk to their farms far from home (Tables 13a & 13b).

Farming accounted for 10.3% of total day's work time in October 1988 and 22% in March 1989. No relationship was observed between the farming time and children's nutritional status. Women did not always work alone on the farm. They were helped by husbands, children, and relatives (Table 14). One househod also employed a labourer. No information as regards the type of work helped with was recorded.

Table 13a--Average time/day spent by women to walk to their farms.

a Farm Near

Time (minutes)	No Women (%)
0	4 (12)
<5	19 (58)
<10	4 (12)-
<20	6 (18)
Total	33

1 Missing Data

Income generating activity accounted for 5.7% and 2.7% of total day's worktime in October 1988 and March 1989 respectively. In post harvest season, almost 1/3 of the women brewed beer and the other 1/3 [4]sold cooked foods, fruit and vegetables or mats which they made for extra money (Table 15,fig.10). While in lean season, only 1 woman brewed beer and 16 (47%) women did other work for extra cash. The time recorded above for beer brewing excluded that spent for selling it, fetching extra water, firewood and preparing the cereal. These

[4] Cooked food and was sold at local school and along the road side; fruit was sold in the village market.

activities may contribute significantly to the total time needed for the whole process.

13b Farm Far		
Time	No Women (%)	
0	4 (12.5)	
[5]<20	3 (9.4)	
<30	2 (6.3)	2 Missing Data
<40	6 (18.8)	
<60	1 (3.0)	
>60	16 (50.0)	
Total	32 (100)	

Table 14--Help For Farming

Helped by	No. Women (%)	
No one	2 (6)	
Husbands	13 (41)	3 Missing Data
Husbands/Children	9 (28)	
Husbands/Relatives	6 (19)	
Parents	2 (6)	
	31 (100)	

4. Income Generating Activities

About 23% of total day's worktime was allocated to resting/eating and recreation activities in post-harvest and 28% in lean seasons. As depicted in Table 5, the time for rest in March 1989 was more than twice as that in October

[5] It seems, for some women walking distance of 10 minutes to the farm meant "farm far away" from home. Though it is possible that the time it took her to get to the farm was under-estimated by her.

Table 15--Time allocated (Minutes) by mothers for Income Generating Activities in post-harvest and lean seasons

Activity	Post-Harvest Season Time (Mean + SD)	No Women (n=34)	Lean Season Time (Mean + SD)	No Women (n=34)	
Beer Brewing	17 + 41	10	2.3 + 13	1	Others
21 + 36	12	20 + 29	16		
Total	38 + 58	22	22.3 + 31	17	

5. Resting, Eating and Recreation

Table 16--Time allocated (Minutes) by mothers for Resting, Eating and Recreation in Post-harvest and Lean Seasons

Activity	Post - harvest Time Mean + SD	No Women (n=34)	Lean Time Mean + SD	No Women (n=34)	
Rest	65 + 85	30	139 + 60	31	
Eating	45 + 19	34	45 + 15	34	
[6]Recreation	43 + 51	27	46 + 36	33	
153 + 103		230 + 84			Total

88. This may imply that, during lean season, farming, was the major acitivity for most women, hence either the number of other activities performed was reduced or less time devoted to them. The available data does indicate that those women who spent a lot of time (2hours or more) for farming also spent equally the same amount of time resting (Fig 11).

[6] included beer drinking in village bar, greeting passers by, talking to neighbours/relatives etc.

EX-HOUSEHOLD TASKS

These include those tasks for which women had to spend sometime away from home for example going to the [7]mill, market and so on. This was observed to be the least common activity involved a small proportion of women (15%-30%) in both seasons (Table 17, fig 12). It accounted for 6% of total day's worktime in October '88 and 3.5% in March '89.

Help When Sick or Pregnant

All mothers were asked if they got any help with household or other tasks while sick or pregnant.

Of 34 women, 26 (74%) had help during pregnancy, (23 only 3rd trimester and 3 all trimesters); 2 (6.6%) got help only when there were problems and 6 (19.4%) did not get any help. Women were helped by husbands, children, and relatives, (Table 18). Type of work helped with was collecting water and firewood, cooking and other household tasks such as washing clothes cleaning yard and so on. Of the 26 women, 11 (42%) had help with one chore, 10 (38.5%) with two and 4 (15.5%) with more than two chores. No information was recorded for 1 (4%) women.

Sick

All mothers indicated that they had some help with one or more chores from one or more persons, either husbands or children or relatives or neighbours /friends. Most often, jobs helped with included, fetching of water and firewood, cooking, and other type of work household chores such as cleaning yard. Few got help with farming, child care and pounding of maize. All but 8 (23.5%) women were helped with more than 1 chore.

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[7] Going to the mill is categorized external household task as it takes them away from home. Alternatively, it may be part of food preparation.

Table 17--Time allocated (Minutes) by women for Ex-houshold tasks post-harvest and Lean seasons

Activity	Post-harvest Time Mean + SD	Post-harvest No Women (n=34)	Lean Time Mean + SD	Lean No Women (n=34)
Go to:				
- Hospital	24 + 62	6	15 + 46	5
- Market	4 + 26	6	0	0
- [9]Others	11 + 26	6	14 + 33	10
Total	39 + 62		29 + 54	

Table 18--Help during Pregnancy

Help	No women (%)
Yes	26 (76)
Not at all	6 (18)
Only when Problems	2 (6)
Total	34 (100)

Village work

Information with regard to women's participation in village project work was recorded for 33 women. Seventeen women, (51.5%) participated in the village project work.

Type of work undertaken included fetching water or making bricks for the construction of village office or the mosque (Table 19).

[9] includes going to the mill, visiting friends, attending funerals, village meetings

Table 19--Type of Village work

Activity	% Women
Office construction	
- fetched water	47
- Made bricks	23.5
Mosque Construction	I7.5
Sew Clothes	6.0
Vegetable Garden	6.0
Total n = 17	100

Summary of Time Allocated for all 6 categories of Tasks in Post-harvest and Lean Seasons

Table 20--Time allocated (Minutes) for all Tasks

Activity	Mean+SD	Minimum	Maximum	Mean+SD	Min	Max
Domestic	258+71	85	417	260+83	117	426
Child Care	107+76	0	315	101+91	0	375
Farming	68+81	0	270	183+131	4.7	484
Inc Gen	38+58	0	202	22+31	0	96
Rest	153+104	27	520	230+84	61	401
Ext H/H	39+62	0	297	28+54	0	219

Table 20 summarizes and compares the amount of time allocated for the activities as performed by women in post-harvest and lean seasons. It may be observed that the range for time spent for each activity performed was large as a result of wide variation in time spent for the same activity. This is indicated by large standard deviations of the Means (in some cases more than the Mean). (Appendix 9 for grand mean time for all the activities).

Figures 13 and 14 the time spent in minutes for different activities and percentage of total work time allocated, respectively in both the seasons.

Activity Time Estimation with Stopwatch and by 24 hour recall Methods - Comparison of Two Methods

Time spent by each mother for all activities performed during the previous 24 hours was estimated in minutes by recall method.

The values recorded were then compared with the corresponding values obtained through "Stopwatch" method for the same day.

Information obtained by "24 hour recall" coincided with the "Measure and Record" day for 24 mothers only. Table 21 summarizes and compares the information obtained for activities by 2 methods.

As shown in Table 21, 21 mothers were able to recall some of the activities performed on the previous day and estimate the time taken. Three mothers could not remember anything. Information on time allocation could be obtained for 14 activities by 24 hour recall method while alogether 22 activities were measured. Total work day by 24 hour recall method was 354 minutes. This was significantly less than that by stop watch method (658 minutes). This was an under-estimation possibly due to the fact that mothers were unable to remember what they did the previous day. It is also assumed that they were unable to recall those activities performed at the same time for example splitting firewood and cooking. The number of women who could recall and estimate time for activities-clean yard, water collection and cooking compared well with what was recorded by the stop watch method. Figure 15 compares the time estimated by 24 hour recall with that recorded by the stop watch method. Figure 16 presents the number of women who were able to recall activities they performed the previous day and time spent against that recorded by the stop watch method.

Table 21--Comparison of Information on Time Allocation by 24 hour recall and stopwatch methods

	24 hour Recall Method		Stopwatch Method	
Activity (Minutes)	Average Time recalled	No Women (Minutes)	Average Time measured	No Women
Clean yard	21	14	20	17
Clean house	10	1	16	16
Water	28	18	24	24
Firewood	150	2	34	5
*split	0	0	12	10
Cook	150	19	151	24
Eat	123	2	40	24
Clean dish	18	5	26	14
Farm	179	6	221	12
*Child care	0	0	24	16
Child wash	7	9	7	15
*Child play	0	0	63	18
Child clinic	0	0	0	0
*Breast feed	0	0	32	4
beer brew	65	1	138	1
Drink Beer in				
*Club	0	0	47	1
*friends	0	0	67	11
*home	0	0	37	5
*shop	0	0	108	2
*hosp	0	0	350	7
village work	22	2	67	12
*Rest	0	0	96	6
Total/day	354	21	658	24

* Time could not be estimated for these activities

Energy Expenditure

Using the WHO criteria (Appendix 5) an attempt was made to calculate the energy expenditure of each women. Hence it was necessarry to categorize activities performed women as recommended by WHO.

These were as follows:

- domestic - occupational activites
- farming
- discretionary
- residual
- sleep

Appendix 8 summarizes women's activities in each of the categories listed above. Energy expenditure of an individual is determined by his/her basal metabolic rate (BMR). BMR is determined by age, sex and body weight of an individual. BMR of each woman was calculated as per formula recommended by WHO (15) Appendix (9). Total energy expenditure per day of an individual was then is derived as multiples of BMR and factors for each category of activities as recommended by WHO Appendix 5 (15).

As can be noted in Table 22, overall average energy ependiture of women was significantly higher during farming season in March 1989 than that during post-harvest season in October 1988. Energy expenditure for farming was significantly higher in March 1989 but less for discretionary and residual. Also, the the underweight women were observed to have significantly lower expenditure than the well nourished women, indicating low activity level of the underweight women.

How the total energy expenditure compares with energy intake is not known as the total food and energy intake of these women was not assessed. However, results of the diet survey carried out by weigh and record method in 1983 during the same seasons indicate clear deficit in energy intake. If the same eating pattern is assumed to persist even now, then, energy expenditure exceeded their energy intake (figure 17). On comparing the mean energy expenditure of the 9 pregnant women with that of rest of the non pregnant women in post harvest season only, no significant difference was observed. This may imply that women who were

Table 22--Mean Energy Expenditure of women in October '88 and March'89.

Activity	Energy Expenditure 1988	1989	Level of Sign
	Calories/day + SD		
Domestic	938 + 281	933 + 338	NS
Farming	175 + 194	456 + 322	p<0.05
Discretionary	282 + 219	194 + 137	p<0.05
Residual	291 + 149	231 + 150	p<0.05
Sleep	495 + 58	478 + 66	NS
Total Mean/day	2181 + 221	2292 + 203	p <0.05

Table 23--Grand Mean Time allocated and Energy Expenditure by Activity of Women

Activity	Time (minutes/day)	Energy (Cals/day)
Domestic	401	936
Farming	135	316
Discretionary	111	238
Residual	226	260
Sleep	567	487
Total	1440	2237

pregnant continued with their usual activities.

DISCUSSION

The results of the study indicated that on average women work time was 11 hrs 4 minutes (664 minutes) per day during post-harvest season and 13 hrs and 4 minutes (825 minutes) per day during the lean season. The total time included the rest time. However, one cannot be certain whether this work should be considered long or short or normal without any reference values. Studies elsewhere have revealed similar observations but the actual amount of

time she should work each day so as to ensure positive energy balance is not reported. (1,2,7,24). Besides most such studies have measured/recorded the time spent for each activity by observation and recall methods which may under or over estimate the number of activities performed and time allocated. This study which examined the types of activities carried out daily and measured the time spent with the stop watch, found that for most women, food preparation, other domestic tasks, childcare and farming were part of their daily routine in both seasons. Income generating activities such as the beer brewing and other activites which took them away from home were either seasonal or periodical. Also the amount of time spent for each activity varied a lot among these women. Meal preparation and other food related activites took up the major share of almost all women's total work time and was mostly due to, among other things, lack of appropriate time-saving devices. However, in Kikwawilla, with an easy access to tap water supply, the time spent for fetching water was much less than that reported elsewhere, and this most likely reduced the total time for domestic activities (4). Fuelwood collection took up a large amount of time but this was not carried out daily. Majority of women were helped with some of their domestic tasks by other female household members or neighbours or relatives. Husbands or male household members might have had an equal share in farm work but very rarely helped with domestic tasks. The same has been reported by other investigators who have attempted to examine the men/women activity pattern. Women usually continue to work in the farm as well being responsible for all the domestic and child care tasks, this often contributes to women's longer work day than that of men or husbands (24, 25). More information is needed on men's activity time allocation before any definite conclusions can be made. Time for child care activities for underfives accounted for just under 2 hours in both seasons.

Although this was more than what has been reported elsewhere, it is most likely that the time reported was an under-estimation. This is because many of the child care related activities are carried out simultaneously with other activities and were often missed out and not recorded by the enumerators. For example, if the mother carried the child on her back while she walked to the farm, this was recorded simply as 'the time for the mother walking to the farm'. The total time recorded for breastfeeding is most certainly an under-estimation. If the mothers put the child to breast on and off too often, it is possible that sometimes the enumerators failed to record the breastfeeding time. Although, type of the child care activities and the total time spent were similar in both seasons, the women's time to play with or being with the child was significantly reduced in the lean season. As Purvis (1985), reported, this may indicate that, the women tend to reduce their own leisure time such as that of playing with the children, inorder to accomodate their extra work time needed for farming (27). Time for farming was observed to be significantly higher in the lean season than that in post-harvest season. Time for sleeping remained constant, while that for resting increased significantly in the farming season implying again that the seasonal variations of work activities are compensated by non-work activites (leisure, visiting, going to the market etc.). Using the mean time spent for activities as cut off point, an attempt was made to compare children's nutrition status with the time taken for domestic, child care and farming activiites. No significant association was noted. However, it may be noted, that overall, there were large variations in the time taken by different women to perform the same activity. Hence the mean owing to a large standard deviation may not be the most accurate cut off point. In addition, the mean is the statistical cut off point and not the actual biological cut off point for the activity level of an

individual in normal physiological state. Also, confounding factors which might affect child nutritional status were not controlled. Hence the need to consider other variables possibly using multivariate analysis is called for before any definitive conclusions can be drawn. Such variables which may modify these relationships have been discussed by Popkin (28). They include the education of the mother which may influence efficiency of resource allocation, available household assets, such as the piped water and modern cooking equipment which may decrease the time needed for household activities and the availability and quality of substitute child care. Also mother's own health and nutritional status may determine her efficiency and work output and hence the time required to perform her tasks (28). Family size seemed to be inversely related to child's nutritional status in lean season only. Children in large households (>6) were nutritionally worse off than those in small households (6 and less). It may be assumed that the large households had more adults who were away from home more often and for a long time for farm work. Children below 5 years of age, cannot accompany their mothers to the work site if their workload is heavy in the farming season. They are probably left behind in the care of other older siblings who might not be the suitable substitutes and food left behind is often not sufficient. Also, food supply is usually inadequate at this time of the year and this may imply inadequate food intake by all family members and particulary the small children who are incapable of competing with adults. But for those children who are taken to the farm, as, Wendel et al. (1992), observed, that the women do not consider it necessary to carry any food for the child as they worked only half a day (29). Women did not recognize the need to feed the children frequently. Beer brewing was a more popular income generating activity than any other during the post-harvest season. Beer is made from maize, millet and

sorghum which could otherwise be used for family food. The women in this study were observed to be well established with the activity, as they also had a beer brewer's association which enabled them to share the equipment. Although, the activity itself is labour intensive and energy demanding, yet to these women, it is their singular source of cash which they control. The profit realized from the sale of beer is three times more than it would be if the equivalent amount of cereal used for making beer was sold. But one wonders if it is worth it in terms of labour input when one considers the long, tedious process (about 3 days) required for its preparation. At the end of it, one is not sure if the beer is fit for consumption. Other income generating activities included selling of the cooked food either at the roadside or in the village school and mat-making. The sale of cooked food has been reported to be beneficial. It implies that children especially those below five years of age could be with the mother while she sells the food, and the children could easily have something to eat if hungry. This has been observed to be positively related to the child's nutrition status (29). "Activity time" obtained by stop watch method compared well with that of 24 hour recall method, for some of the routine domestic tasks such as cooking, water-collection and cleaning yard. Any activity which might have overlapped with another one was never mentioned. However, the information obtained through the recall method probably depended on how it was asked for. There have been many studies on how women spend their time and most of them have used observation and recall methods. But these are not recognized to be reliable in estimating time spent on specific activities. Besides, the women in rural areas do not have any means to keep record or track of the time spent on any particular activity.

The energy expenditure of women, calculated on the basis of an individual's weight and physical activity level, was significantly lower in the post-harvest season than that in the lean season which also coincided with the food shortage period. The energy expenditure of the women was what would be expected of a

rural women according to WHO. But this appeared to be significantly higher than their energy intake which did not meet even the recommended intake for the day. This is reflected on the women's nutritional status; the number of underweight women in the lean season was twice that in the post-harvest season. It is well recognized that poor nutrition affects an individual's acitivity level and physical performance. This is most likely, another reason why women work long hours (28). Therefore, the energy expenditure of the underweight women was significantly lower than those of the well nourished women. However, to understand the interplay of all the factors related to women's work and their energy expenditure and how this might affect their health and nutritional status and that of their families, a longitudinal study is proposed.

CONCLUSION

The study was carried out to examine the women's activity pattern and time allocation and energy expenditure in the lean and post-harvest seasons in Kikwawila village, Kilombero District, Morogoro region, Tanzania. An atttempt was also made to assess the impact of women's work on their children's nutritonal status. Women's work pattern and energy expenditure were observed to vary with season. But, no relationship was observed between women's work and the children nutritional status. The study also raised questions as regards the reference values for women's worktime and men's contribution to household work. Therefore, to understand the implications of the findings in the long term, a longitudinal study which will consider all the intermeditory and cultural factors known to determine women's work and its impact on their health and that of their family is recommended.

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